SEPTEMBER, 1925

Railway Engineering and Maintenance

RAIL ANTI-CREEPER
Economical - Efficient
and

CHICAGO THE P. & M. CO. NEW YORK

HY-CROME

MADE in many sizes but only one quality the action of every HY-CROME Nut Lock is identical.

Maintenance of Way Engineers everywhere are recognizing more and more that the common nut lock regardless of price has no place in present day rail joint efficiency.

The non-fatiguing spring action and unbreakable qualities of Hy-Crome guarantees permanent track joint security at minimum maintenance.

THE RELIANCE MFG. CO.
MASSILLON, OHIO
NEW YORK CLEVELAND DETROIT CHICAGO
ST. LOUIS SAN FRANCISCO
N. S. Kenney, Munsey Bldg., Baltimore, Md.
Montreal, Quebec, Canada, McGill Bldg., Engineering Materials, Ltd.

RAILWAY ENGINEERING AND MAINTENANCE
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Alphabetical Index to Advertisers, Page 48 Classified Index to Advertisers, Pages 46 & 48

Motor Car Values
and
Some Questions Worth Considering

Does the motor car you buy measure up, unit for unit with MUDGE QUALITY?

Does the service you receive equal MUDGE SERVICE?

Does the motor car you buy haul men and material to and from work at the same low price shown by MUDGE CARS?

Does the motor car you buy adhere to the proven path of sensible mechanical practice as does THE MUDGE?

Does the motor car you buy give that dependable day in and day out service for which MUDGE CARS are noted?

The ever increasing demand for Mudge Motor Cars is based on railway officials' observance of a seventeen years' adherence to a standard and a principle unaffected by the times or engineering fancies and a performance record during this time.

We manufacture a complete line of railway inspection and section cars; side drive or center load; direct connected or free running; air cooled or water cooled motors.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

Steel

STEEL tanks will reduce your cost of roadside water delivery per gallon of storage.

Because they give long life with a minimum of maintenance when properly painted.

A tank constructed of any material may be kept in service most of the time by spending enough money for repairs and replacements.

A *steel* tank may be kept in service for an unusual span of years merely by painting it about every four years.

It is a fact that the *total* cost of maintaining a *steel* tank in service over a period of years is extremely low.

Let us quote you on making your entire territory steel-tank equipped.

CHICAGO BRIDGE & IRON WORKS

CHICAGO	NEW YORK	DALLAS	SAN FRANCISCO	ATLANTA
2452 Old Colony Building	3156 Hudson Terminal	1646 Praetorian Building	1007 Rialto Building	1036 Healey Building

HORTON STEEL WORKS, LTD., Bridgeburg, Ont.; Montreal; Toronto; Winnipeg

HORTON TANKS

417

The New Union Station at Chicago.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 21 **September, 1925** **Number 9**

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Business Manager

WOULD YOU LIKE TO KNOW

How to block up a steel tank for moving it?

How joint renewals affect the life of rail?

What may be done to improve concrete stair construction?

How a diver was employed to expedite trestle construction?

How one road protects track where rock slides occur?

Answers to these and other questions will be found in this issue.

ELMER T. HOWSON
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Associate Editor

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In sending us change of address please be sure to send us your old address as well as the new one.

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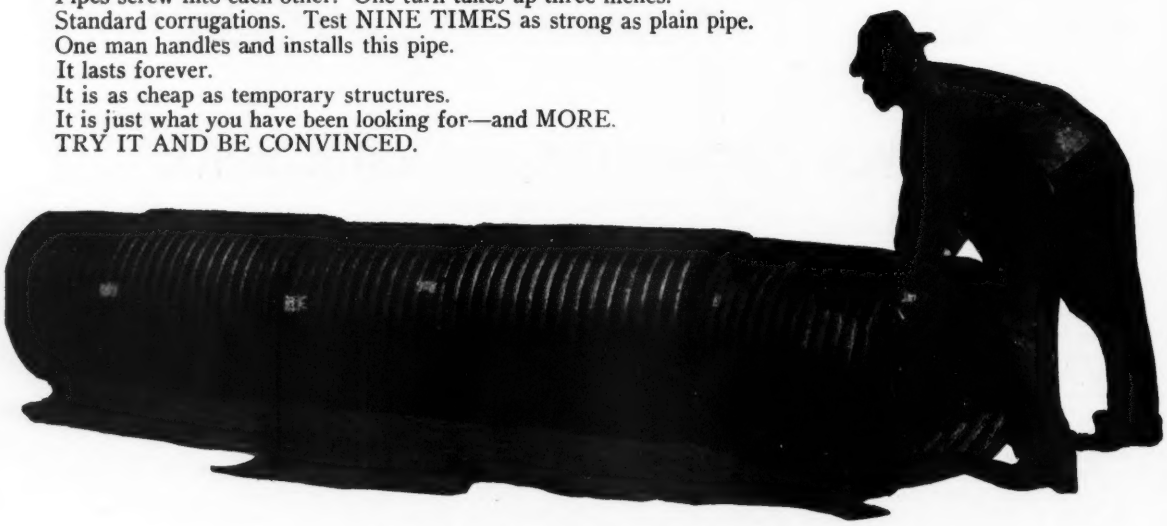
Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Allied Bureau of Circulation (A. B. C.)

Introducing "THE MISSING LINK"

SPIRAL CORRUGATED CAST IRON CULVERT PIPE

Snappy Facts About It

Solid, round, vertically cast, pure remelted pig iron. *No scrap.*
Lengths of three feet, three inches.
Pipes screw into each other. One turn takes up three inches.
Standard corrugations. Test NINE TIMES as strong as plain pipe.
One man handles and installs this pipe.
It lasts forever.
It is as cheap as temporary structures.
It is just what you have been looking for—and MORE.
TRY IT AND BE CONVINCED.



Entering the Pipe by Rolling in on an Angle.

Screwing Pipe Together. One Turn Takes Up Three Inches

WE HAVE BEEN MAKING CAST IRON CULVERT PIPE FOR TWENTY YEARS

Write for Details and Prices

American Casting Company

Box 591 BIRMINGHAM, ALA.

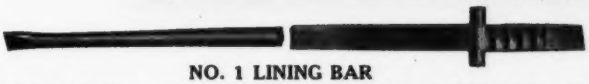
HACKMANN COMBINATION TRACK LINER

SAVES 60% OF YOUR LABOR AND TOOL COST

HACKMANN Track Liners Will Line Track, Frogs, Switches, Space Ties, Raise Low Joints, Without Disturbing the Road Bed. No Digging Necessary

60% Labor Cost Saved

3 Men With Hackmann Track Liners Do the Work That Required 9 to 12 Under the Old Method Hackmann Track Liners Will Pay For Themselves By the Saving in Labor Cost



NO. 1 LINING BAR

HACKMANN COMBINATION LINING BARS

(VERONA MADE—HEAT TREATED)

The No. 1 lining bar with chisel end and the No. 2 combination tamping and lining bar are drop forged from special steel specially tempered with 1-inch drop forged lugs as an integral part of the bars, for use with Hackmann bases.

Tests on different roads have proven conclusively that the new Hackmann Combination Track Liner gives more than double the efficiency of any liner now on the market.

DEMONSTRATIONS

We Will Gladly Demonstrate the Efficiency of This Equipment Upon Request

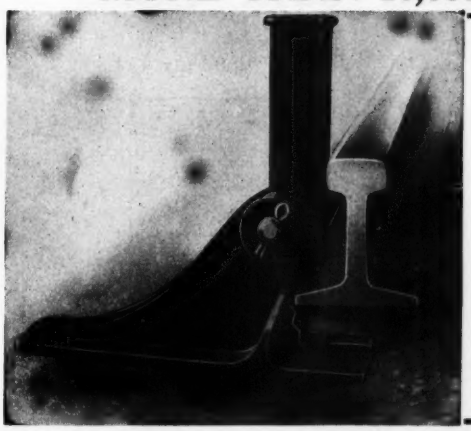
NO. 2 TAMPING AND LINING BAR

NOTE THE TWO STEP FEATURE AT TOP OF BASE

You can make at least two pulls without resetting the liner. Just move the bar to the top notch.

Weight 20 lbs.

MORE THAN 10,000 OF OUR LINERS NOW IN USE



The IDOL TRACK LINER

NOW IN USE ON 90 RAILROADS

The Idol Track Liner will line track frogs, switches, space ties, raise low joints without disturbing the road bed as no digging is necessary. They will pay for themselves every day by work you will be able to do with a few men. They will save you 50% in labor costs.

The Idol Track Liner can be operated with any ordinary lining bar.

THE HACKMANN RAILWAY SUPPLY CO.

RAILWAY SAVING DEVICES
723 So. Wells St., CHICAGO, ILLINOIS

VERONA TOOL WORKS
New York, N. Y. Boston Mass.
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THE HOLDEN CO. Ltd., Canada
Toronto Montreal Winnipeg
Vancouver

SEE OUR APPLIANCES ON EXHIBITION AT BOOTH NO. 22 OF THE TRACK SUPPLY ASSOCIATION EXHIBIT, HELD IN CONJUNCTION WITH THE ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION OF AMERICA, TO BE HELD AT KANSAS CITY, MO., SEPTEMBER 22, 23 AND 24.

THE DIFFERENTIAL AIR DUMP CAR

FOR LOWEST UNIT COST OF HANDLING MATERIAL, SAFETY, LOW MAINTENANCE, LONG LIFE AND GENERAL USEFULNESS

LOW HEIGHT The Differential Air Dump Car is only 7 ft. 4 in. from top of rail to top of sideboard. This gives stability and easy loading. The 24 cu. yd. (level full) car can be loaded full length with Standard Ditcher.

SIMPLICITY There is a minimum number of working parts. The body rests on four points directly over the bolster side bearings and THERE IS NO LOCKING MECHANISM.

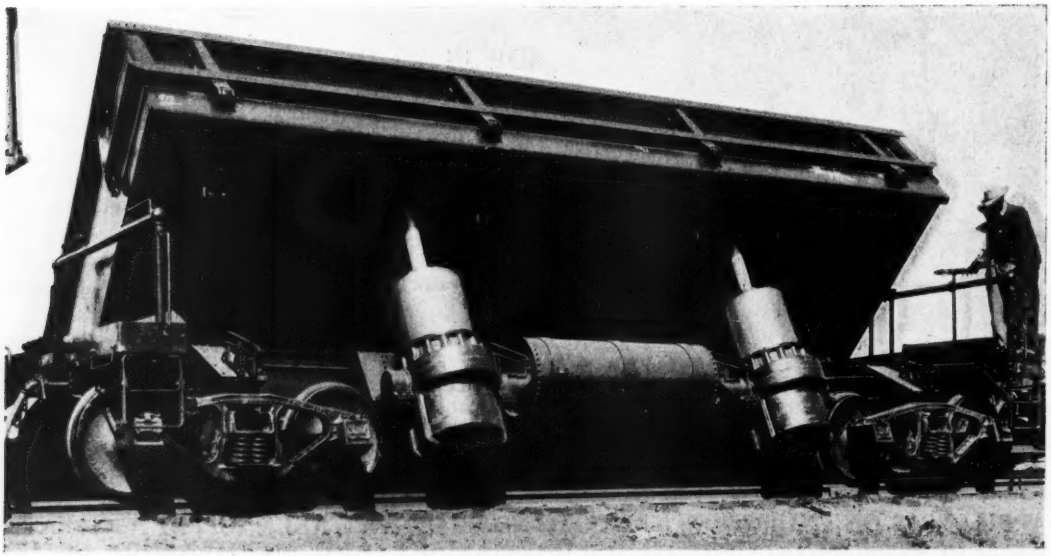
DUMPS CLEAR OF TRACK The Differential Air Dump Car casts the load well beyond the ends of the ties. The down folding door forms a chute which carries the material away from the track and protects the ballast.

POSITIVE DUMPING Dumping is quick and certain. Can be dumped to either side without changing any mechanism. No danger of accidental dumping.

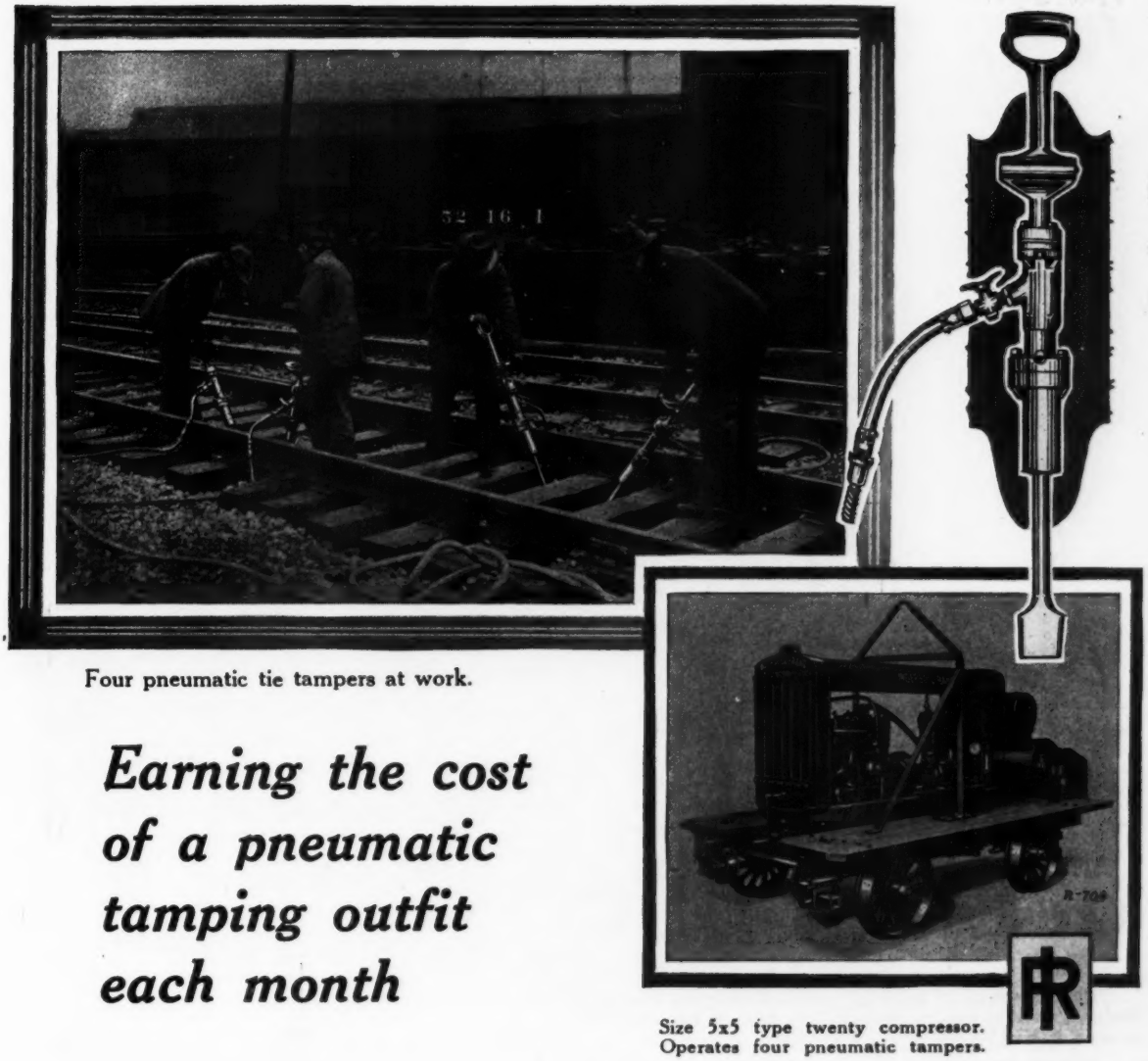
CLEAN DUMPING Clear discharge opening and steep dumping angle of 50 degrees insures clean dumping of material of any size or class.

Complete information in Bulletin D-15

THE DIFFERENTIAL STEEL CAR CO.
FINDLAY, OHIO



Rear view of the Differential Air Dump Car in dumped position. Note the rugged construction and simplicity.



Four pneumatic tie tampers at work.

Earning the cost of a pneumatic tamping outfit each month

Size 5x5 type twenty compressor. Operates four pneumatic tampers.

A railroad using twelve four-tool Ingersoll-Rand Tamping Outfits reports that these machines save the cost of one outfit each month. In other words, twelve months of service will see the twelve units completely paid for out of savings made.

This saving does not take into consideration the fact that much better work is done by the pneumatic tamper than by hand methods and that the track will stand up two to three times longer than if tamped by hand.

Ingersoll-Rand tamping outfits are portable air power units which can be used to save labor on a wide variety of work. Their usefulness does not end with tamping only, but extends the year round on rail laying, bridge work and other repair and maintenance work. Ask for complete data.

INGERSOLL-RAND COMPANY 11 BROADWAY, NEW YORK CITY

OFFICES IN PRINCIPAL CITIES THE WORLD OVER

For Canada—Canadian Ingersoll-Rand Co., Limited, 260 St. James Street, Montreal, Quebec

Ingersoll-Rand

Guarantee
Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—
—or—
Write your own guarantee!
THE OWEN BUCKET CO.

A Mouthful at Every Bite

The fierce attack of the jungle tiger is concentrated in his steel-like jaws, whose vicious and powerful force gains for him a mouthful at every bite. How like an Owen Bucket!

Built on the principle of correct distribution of weight and properly applied leverage, Owen Buckets possess the unusual ability of performing consistently — day after day — the work of tearing materials from ground or pile at the rate of a chuck-full bite at every grab.

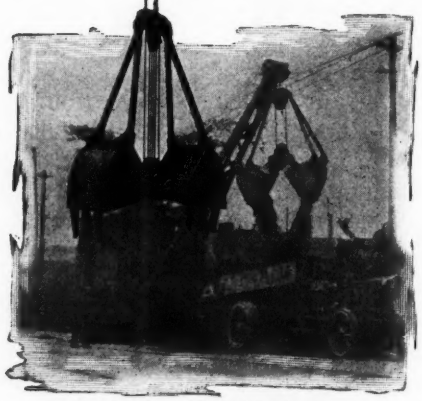
There are nine specific points in superior construction that mark the Owen as a Bucket which means a greater value for your digging dollars. These advantages have been described and illustrated in a small folder which we call "2-A." We shall be glad to send you a copy, for we want you to know about the strong and sturdy construction of Owen Buckets—their adaptability—their earning power.

Write for the folder today!

The OWEN BUCKET Co.

905 Rockefeller Building Cleveland, Ohio

Baltimore Chicago Dallas Los Angeles Minneapolis Philadelphia
Pittsburgh New York Miami Portland St. Louis San Francisco



Here is a ¾ yard Type "J" Owen Digging Bucket excavating pipe line trenches and loading into trucks. This is one of three Buckets owned by D. Lowensohn, Cleveland.

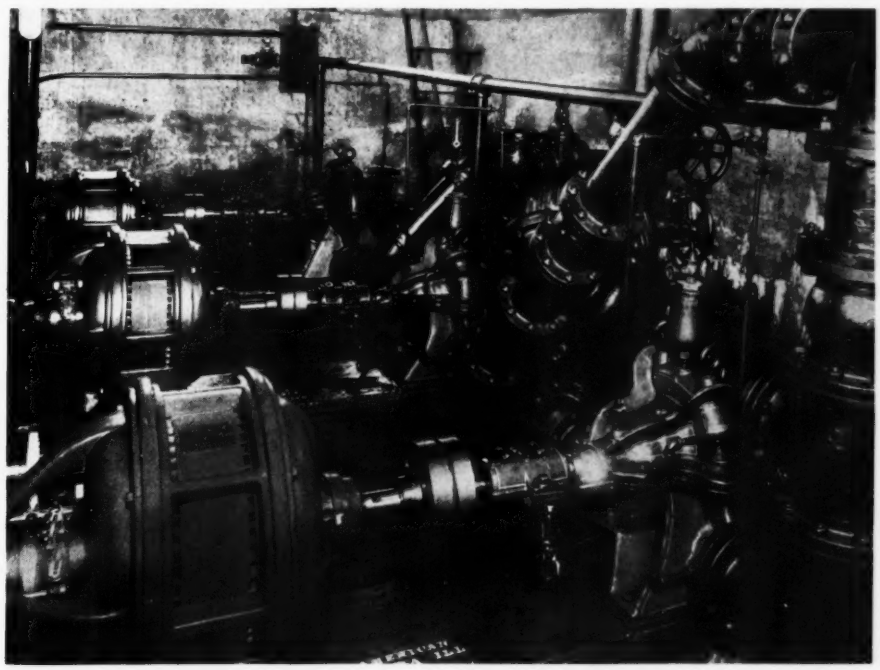
OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAYS WORK

Owen Buckets

INSURE A BIGGER DAY'S WORK

© O.B.C.º

AMERICAN
AURORA, ILL.



"AMERICAN" Pumps were installed by the Chicago & Eastern Illinois R. R. at Villa Grove, Illinois, for supplying water to locomotives, round houses and shops.

The plant consists of three 5-inch double suction centrifugal pumps, installed in pit 6 feet below station floor level. One pump takes water from the river 100 feet distant, and delivers it at the rate of 500 gallons per minute against a total head of 21 feet, into surface reservoir adjoining pumping station. The other two pumps are duplicates of each other, and automatically controlled by pressure governors, operating separately, and deliver water into an elevated tank 1200 feet distant, near shops, at the rate of 750 gallons per minute.

GENERAL OFFICES AND WORKS - AURORA, ILL.

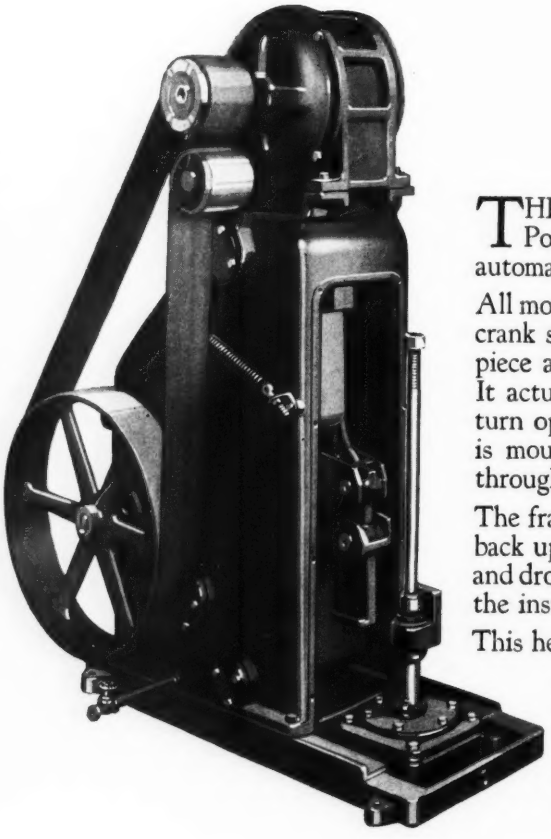
THE AMERICAN WELL WORKS

NEW YORK, N. Y. ..... 165 BROADWAY
MILWAUKEE, WISC. . . FIRST WISC. NAT. BANK BLDG.

BRANCH OFFICES
CHICAGO, ILL. FIRST NATIONAL BANK BLDG.

DALLAS, TEXAS ..... WESTERN INDEMNITY BLDG.
SAN FRANCISCO, CALIF. ..... 635 MISSION STREET

And Now Totally Enclosed Two Stroke "American" Deep Well Head!



THE new "American" Two Stroke Deep Well Power Head is totally enclosed; compact and automatically lubricated.

All moving parts run in a bath of oil. The mounted crank shaft of the two-throw type is made in one piece and the main driving gear is in the center. It actuates two all steel walking beams which in turn operate two cross heads. The electric motor is mounted on top of the cast frame and drives through an endless belt.

The frame in the new two stroke head may be slid back upon its base, permitting the removal of rods and drop pipe when necessary without tearing down the installation.

This head is furnished in both 18" and 24" strokes.

Compact, rigid, demanding but little attention—this new power head is the result of over half a century of pump design!

Catalogues and engineering data will be sent upon request.

GENERAL OFFICES AND WORKS - AURORA, ILL.

THE AMERICAN WELL WORKS

NEW YORK, N. Y. . . . . 165 BROADWAY
MILWAUKEE, WISC. . . FIRST WISC. NAT. BANK BLDG.

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DALLAS, TEXAS . . . . . WESTERN INDEMNITY BLDG.
SAN FRANCISCO, CALIF. . . . . 635 MISSION STREET

"A Derail for Every Requirement"

Quality and Economy Combined

Q & C Mechanical Derails are positive in action. They embody both the adjustable and interchangeable features, permitting one model being used on several rail sections.

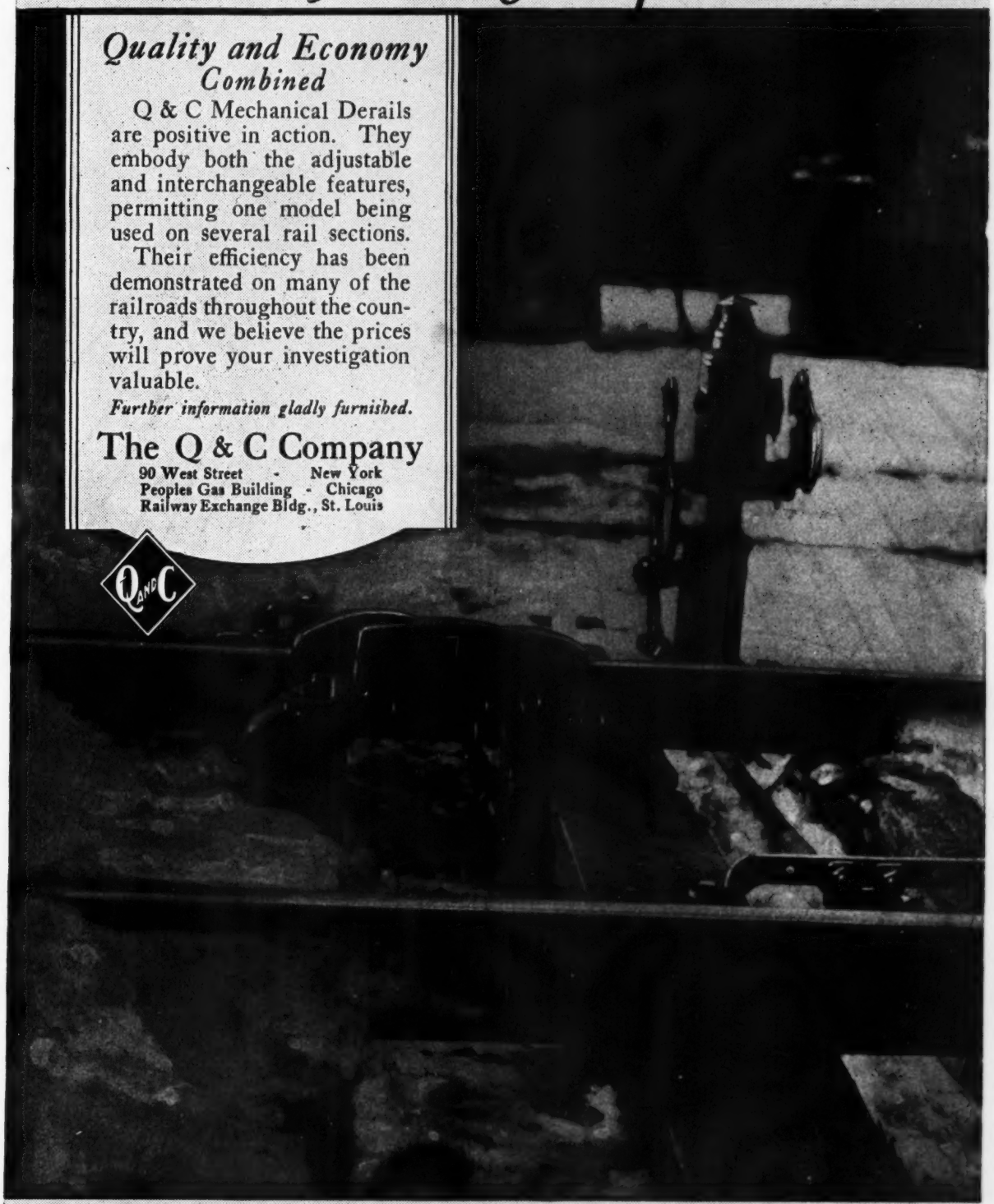
Their efficiency has been demonstrated on many of the railroads throughout the country, and we believe the prices will prove your investigation valuable.

Further information gladly furnished.

The Q & C Company

90 West Street - New York
Peoples Gas Building - Chicago
Railway Exchange Bldg., St. Louis

Q AND C



Adjustable and Interchangeable

CONTINUOUS JOINT

"HEAD FREE" TYPE

IF YOU WERE TOLD HOW TO END THE COST OF RAIL JOINTS ON YOUR RAILROAD

?

WOULD YOU NEGLECT THE OPPORTUNITY TO TELL YOUR SUPERIOR ABOUT IT

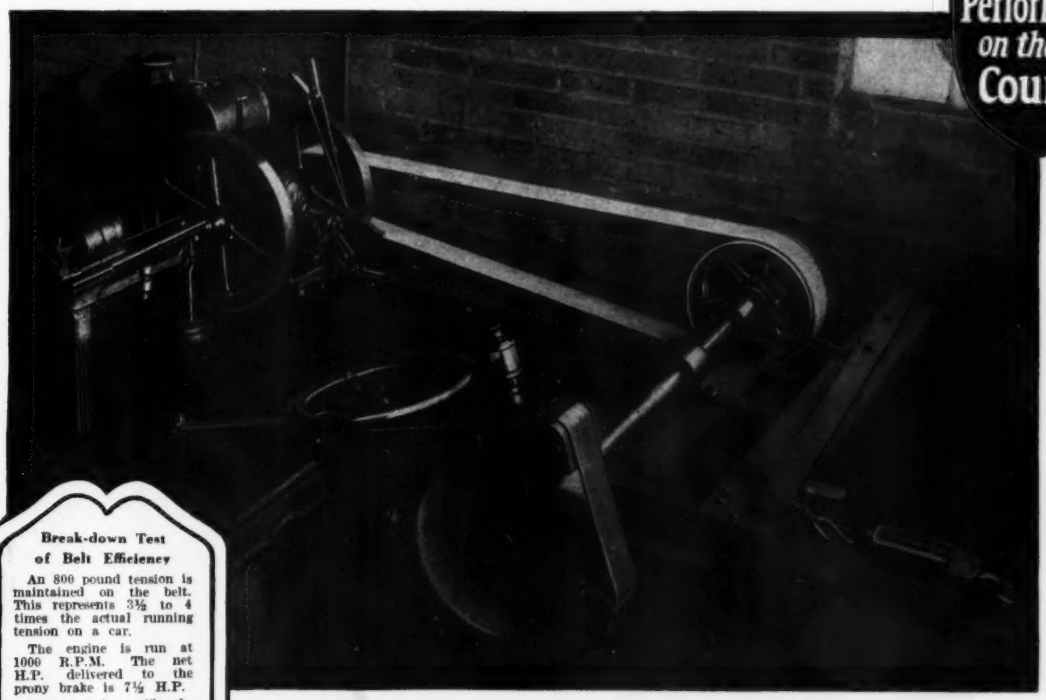
WHY NOT FIND OUT HOW SUCH A THING IS POSSIBLE

?

ASK US AND WE WILL TELL YOU HOW TO GET THE PROVEN FACTS

The Rail Joint Company

61 BROADWAY, NEW YORK CITY

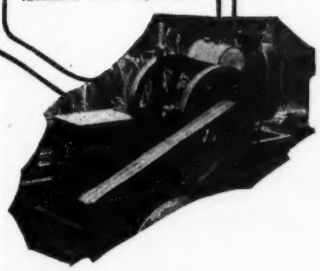


Break-down Test of Belt Efficiency

An 800 pound tension is maintained on the belt. This represents 3½ to 4 times the actual running tension on a car.

The engine is run at 1000 R.P.M. The net H.P. delivered to the prony brake is 7½ H.P.

This test is a "break-down" test and is used to do to a belt in a few hours what months and years of service will do on track. A few hours on the test stand represents a year on the track, this ratio being definitely established from experience.



Belt Drive

Belt Driven Cars Predominate. Two well made pulleys (one on the engine shaft, the other on the car axle) plus an endless CORD belt form the simplest and most economical, most flexible and noiseless transmission known. FAIRMONT cars employ no idler pulley—Engine is mounted on a sliding base to tighten belt.

Influencing the Entire Industry!

ITEM after item in the mechanical construction of motor cars can be pointed out which first was used by Fairmont and later adopted by the industry generally.

The belt drive now accepted as the only practical form of power transmission for motor cars is the product of Fairmont's pioneering efforts.

Many of the improvements made in motor car belting during the past two years are also the result of Fairmont leadership in analyzing motor car requirements.

The testing set shown above designed by Fairmont has been particularly helpful to belt manufacturers and is directly responsible for the endless CORD construction of the belt used on Fairmont Motor Cars.

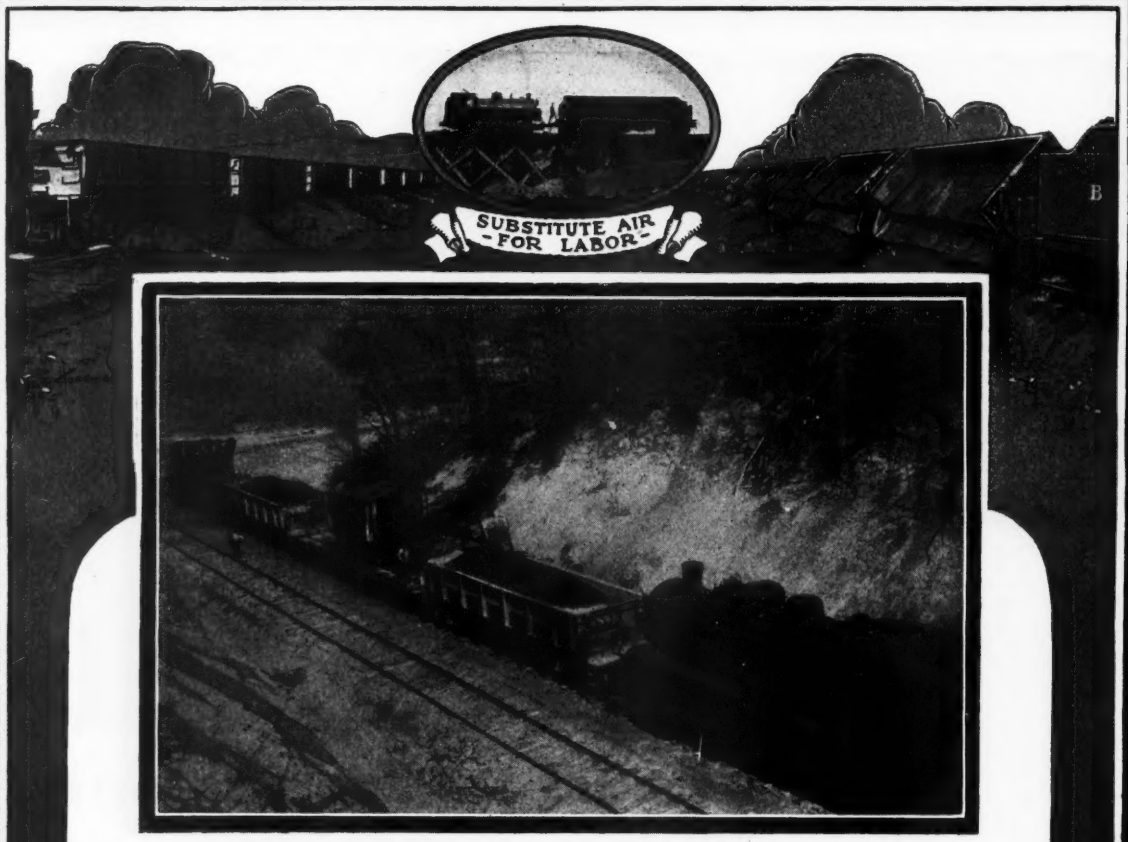
Forever forging ahead in the advancement of motor car efficiency, Fairmont continues to excel in the number of motor cars used by the leading railroads of the country.

FAIRMONT RAILWAY MOTORS, Inc.
Fairmont, Minnesota

DISTRICT SALES OFFICES:
New York Chicago St. Louis San Francisco Washington, D. C. Winnipeg, Canada

Fairmont

Ball Bearing Engines and Railway Motor Cars



Workmen That Never Tire and Never Draw Wages

THAT is the performance story of Extension Side Dump Cars. They do the work of many men with hand shovels and more than that, the work is done practically instantaneously.

Extension Side Dump Cars are sturdy, powerful and have many distinctive features which make them ideal for every class of dumping service. There is the *down turning door* which allows free dumping of big boulders and rip-rap material—there is the *high capacity* 30 yds. level, 42 yds. normal; 100,000 lb. to 140,000 lb. A. R. A.; there is the smooth *rolling motion* which permits dumping without excessive shocks; there is *simplicity of operation*, cars can be dumped from any car in the train and there is the *rugged construction* which makes these cars stand up against sudden shocks caused by heavy materials being dropped from loading equipment.

Purchasers of Extension Side Dump Car equipment, therefore, enjoy to the fullest extent the advantages of air operated dump cars.

CLARK CAR COMPANY

Pittsburgh, Pa.

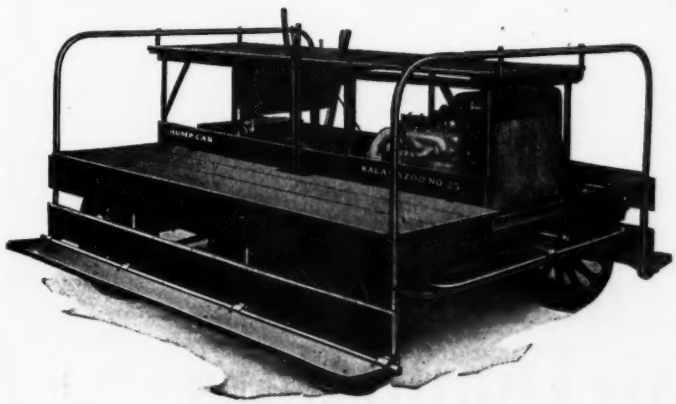
New York	Chicago	San Francisco
52 Vanderbilt Ave.	122 South Michigan Ave.	Rialto Bldg.

Extension Side Dump Cars

— Air Operated —

KALAMAZOO

MODERN RAILWAY SERVICE DEMANDS THE BEST IN MOTOR CARS



Kalamazoo No. 25 Hump Car

THE KALAMAZOO No. 25 MOTOR CAR

HAS STOOD THE TEST

We have accurate records of Kalamazoo No. 25 Motor Cars that have been in operation from 150,000 to 200,000 miles and are still in service

The Kalamazoo No. 25 Motor Car which we have been building for the past ten years, embodies all the latest improvements in automotive engineering and records prove that the car actually pays for itself in a short time under the most severe operating conditions.

Kalamazoo Railway Supply Co.

New York City
Chicago
St. Louis
New Orleans

MANUFACTURERS

Kalamazoo, Michigan, U. S. A.

Havana London Mexico City

Cable Address "VELOCIPEDE"

San Francisco
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Spokane
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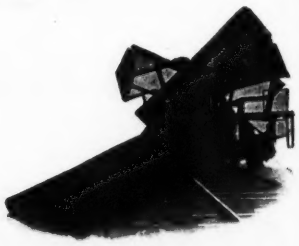
Railway Motor Cars
Gasoline Passenger Cars
Motor Car Trailers
Cattle Guards
Electric Crossing Gates
Hand Cars
Push Cars
Velocipedes
Track Drills
Pressed Steel Wheels
Wood Center Wheels
Gauges and Levels

Actual photograph of Kalamazoo No. 25 Motor Car with Kalamazoo Trailers in extra Gang Service



Western Two-Way Air Dump Car with Apron

You can now RENT Western Air Dump Cars

If your Board will not pass an A. F. E. for dump cars, why not rent them and charge the outgo to maintenance? As you know, the saving over hand-shovelling is enormous. We give purchase option.

Sizes from 12 to 45 cubic yards; capacities, 60,000 to 140,000 pounds.

Write today for particulars.

Yours for greater economy.

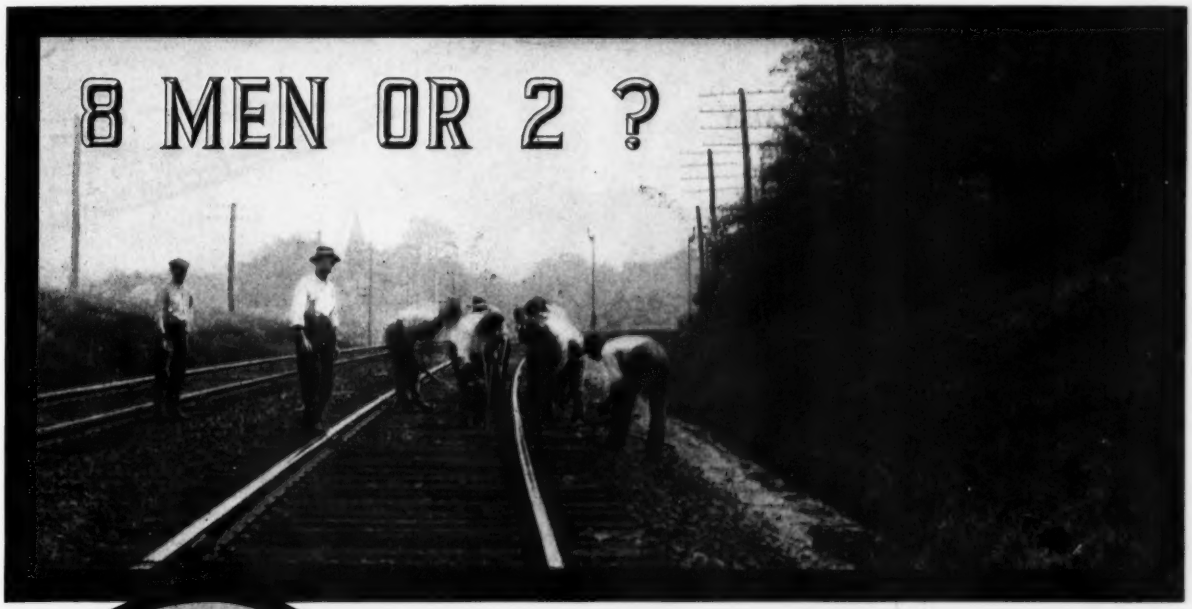
Western Wheeled Scraper Company

Founded 1877

Earth and Stone Handling Equipment

AURORA, ILLINOIS

Western *That's Why*



Two men with Jackson Electric Tie Tampers will tamp as many ties as eight men with picks.

The two men will also tamp more uniformly and more thoroughly so that the track will stand up for a longer time.

The Jackson Electric Tie Tamper not only saves labor directly, but also indirectly because of the greater permanence of its work.

Are you using tampers as labor savers?

ELECTRIC TAMPER & EQUIPMENT CO.
RAILWAY EXCHANGE CHICAGO, ILLINOIS

Requires Oiling Only *Once a Month!*

Flood Lubrication Multiplies Life

PATENTS PENDING

AT LAST! An Ideal Pump For Remote Control

The new GARDNER totally enclosed pump with motor drive may be located miles away from your right of way and controlled by an electric switch. It will need to be visited only once a month, to renew oil. It is the ideal pump for railroad water service and for all other service as well. Protected gears and bearings, and perfect flood lubrication, multiply life. Send for new Bulletin, EP-1.

Territory Still Available to Agents

THE GARDNER GOVERNOR CO.

Quincy, Illinois

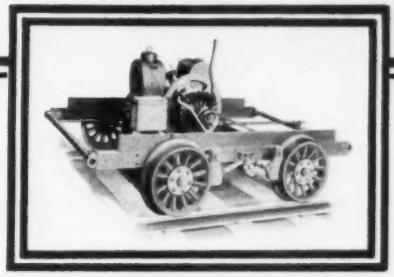
CHICAGO 549 Washington Blvd. | NEW YORK 534 Singer Bldg. | PHILADELPHIA 604 Arch St. | HOUSTON 1242 Heights Blvd. | SAN FRANCISCO 401 Rialto Bldg. | LOS ANGELES 2122 East St.

GARDNER GOVERNORS PUMPS·COMPRESSORS

GARDNER

The Sheffield 44

Note the high safety rail and automobile type pressed steel frame.

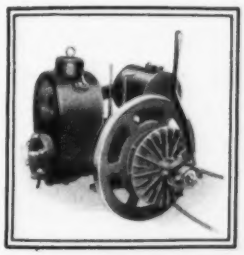


By taking out four bolts, the entire body can be lifted free from the chassis, giving full access to the engine and driving mechanism.

The *Drive* that always gets you there

A *positive* drive. A drive that always delivers the full power of the engine to the wheels. A drive that is each day bringing increasing favor to the new Sheffield 44, one-cylinder, water-cooled section car.

Naturally, it is a chain drive. That means total elimination of the costly delays and the expensive repairs that always go with belt drive. And the chain is driven through a clutch that cannot be burned out. Slip it as much as you want. You can't burn it out. You can't impair its firm grip when completely engaged. Large faces with cooling fins that dissipate the heat, have made this better action possible.



The heart of the new "44" is this simple, fool-proof clutch, with cooling fins and other finely worked out details that insure positive but velvety action and prevent burning out.

And the perfected drive is simply the finishing touch to a car that in every detail represents the most advanced design. The engine is fully accessible and is bolted tight to a pressed steel auto type frame. Considering its exceptional ruggedness, the car is remarkably light.

Our representative will give you complete information. Or write for descriptive bulletin.

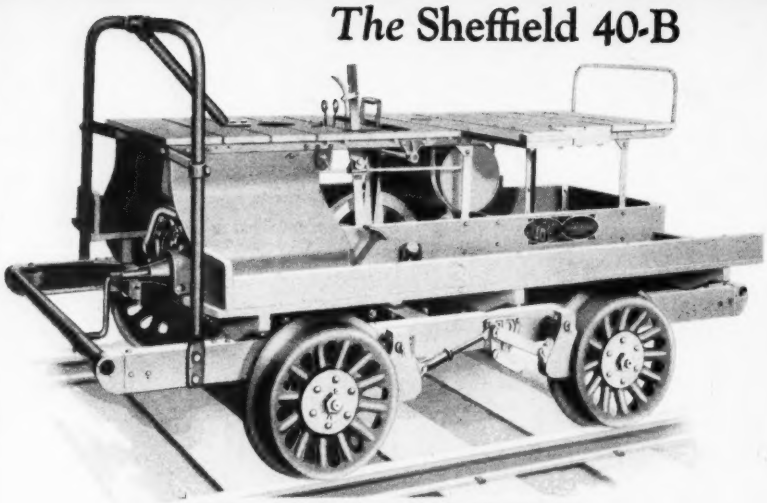
The new two-cylinder, air-cooled, friction drive "40-B" is described on the following page.

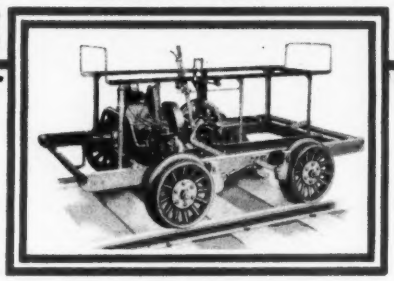
FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first

A788

The Sheffield 40-B





Note the rugged automobile type pressed steel frame and the wide decks with raised sills for retaining tools.

Body easily removed, giving full access to chassis.

Even *better* than its predecessor

Could there be a better car of its kind than the widely used, widely praised Sheffield 40? The answer is the new Sheffield 40-B. It retains the many features which won so many friends for the Sheffield 40, but is more highly developed in every detail.

The engine now expresses the latest developments in automotive engineering. The crankshaft is mounted on Timken Taper Bearings which absorb the thrust of the greatly simplified friction transmission. Three point support assures perfect alignment. The axles turn in Timken Taper Bearings. Cutting of the axles is impossible.

And, equally important, the "40-B" is equipped with a pressed steel auto-type frame — probably the strongest ever used on a car of this type.

The "40-B" is truly a worthy representative of the complete line of F-M cars —each a leader in its class.

Ask for bulletin information on this car or any of the other railway equipment listed below.

COALING STATIONS

The finest of equipment backed by undivided responsibility permanently guarantees every coaling station that is

Built throughout by
FAIRBANKS-MORSE

FAIRBANKS, MORSE & CO., *Chicago*
Manufacturers of railway motor cars, hand cars, push cars, velocipedes, standpipes for water and oil, tank fixtures, oil engines, steam, power and centrifugal pumps, scales, complete coaling stations.

FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first

International

The House of Quality and Service

2¢5

International
Products Also Include

Creosoted Poles
Creosoted Piling
Creosoted Lumber
Creosoted Timber
Creosoted Switch Ties
Creosoted Mine Timber
Creosoted Barge Sheathing

A half century of experience in timber preservation is at your service.

Let Choice *Not Chance*
Govern Your Tie Purchases

If you postpone your tie purchases until the last minute:

If you delay until the time when the demand for ties is at its height:

If you wait until active competition in the woods puts prices up and quality down:

If you do these things you are taking a chance. But—

If you ***contract now*** and let ***International*** choose your ties, you not only save time and expense in securing them, but you receive the best assurance of tie quality.

Every ***International*** tie is sound, full size, carefully graded, and produced far in advance of use to receive proper air seasoning. Our insurance of quality is driven into every tie in the form of our ***International*** Dating Nail.

DON'T WAIT—International is ready and at your service

International Creosoting & Construction Co.

General Office—Galveston, Texas

Plants: Texarkana, Texas Beaumont, Texas Galveston, Texas

Casey Jones

Heavy Duty Railway Motor Car

Casey Jones 550 H. Hump and Extra Gang Car

Standard Ford Motor

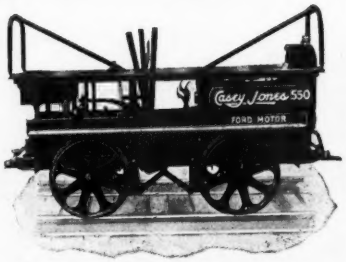
MAKING FORD MOTOR SERVICE AVAILABLE TO RAILWAY USERS HAS BEEN THE MEANS OF ELIMINATING COSTLY DELAYS.

DESIGNED FOR HEAVY DUTY SERVICE AND EQUIPPED WITH THE MOST STANDARD POWER UNIT IN THE WORLD, THIS TYPE OF CAR HAS BEEN ADOPTED BY ALL LEADING RAILWAYS.

STANDARD FORD STARTING AND LIGHTING EQUIPMENT IS FURNISHED WHEN DESIRED.

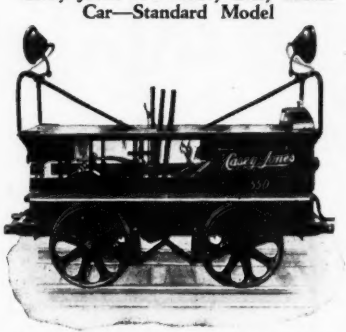
THERE IS ALWAYS A FAVORABLE DIFFERENCE IN PRICE.

WRITE FOR INFORMATION

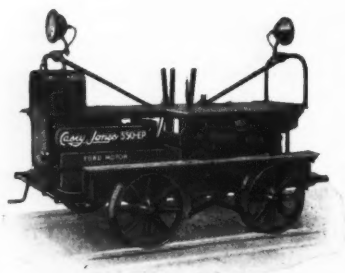


Casey Jones 550 Heavy Duty Motor Car—Standard Model

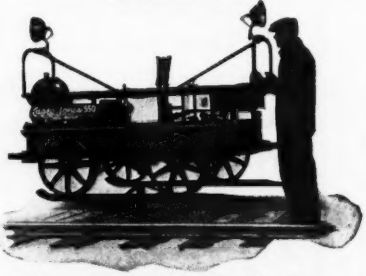
Casey Jones 550 P. Platform Car For Hauling Material



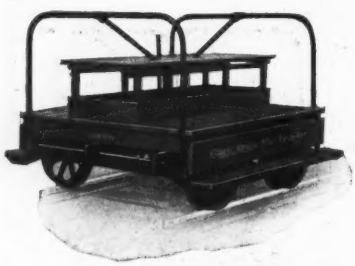
Standard Ford Starting and Lighting Equipment—Extra



Casey Jones 550 E. P. Electric Power Car—7½ K. W. Generator



Turntable H. D. X. for Handling Large Motor Cars



Casey Jones 552 Heavy Duty Trailer For Large Gangs

Casey Jones 550T with Full Enclosed Top

SPECIFY Casey Jones An investment in permanent satisfaction

NORTHWESTERN MOTOR COMPANY, Eau Claire, Wis., U. S. A.

LUNDIE

SAVES COSTLY TIES

THE accompanying photograph clearly shows the remarkable tie protection assured by Lundie Plates even under the heaviest traffic conditions.

After more than four years of continuous service on one of the heaviest coal carrying roads in the United States, the exposed tie to the left shows practically no mechanical wear.

Such important savings of costly ties, resulting from distinctive features of the Lundie Plate, are typical of every installation.

Prior to the use of Lundie Plates on this particular road, where 17 degree curves are not uncommon, both tie rods and rail braces were indispensable. Lundie Plates have eliminated both—have never failed to hold tracks to rigid gauge and have added 75%. to the life of rails.

To substantially lower track maintenance cost—use the Lundie Tie Plate.

The Lundie Engineering Corporation
920 Broadway, New York
166 West Jackson Boulevard, Chicago

TIE PLATE

ARMCO Culverts in Railway Service

No. 23 of a Series

Location: Winston-Salem Railroad.

Traffic: Average passenger and freight.

Installation Data: A 60-inch ARMCO Culvert 60 ft. long installed in 1916. Wing type of headwall protects the embankment.

Condition: Excellent. Inspected and photographed 1922.

Remarks: This culvert is one of a large number of corrugated culverts giving excellent service under this Eastern Railroad.

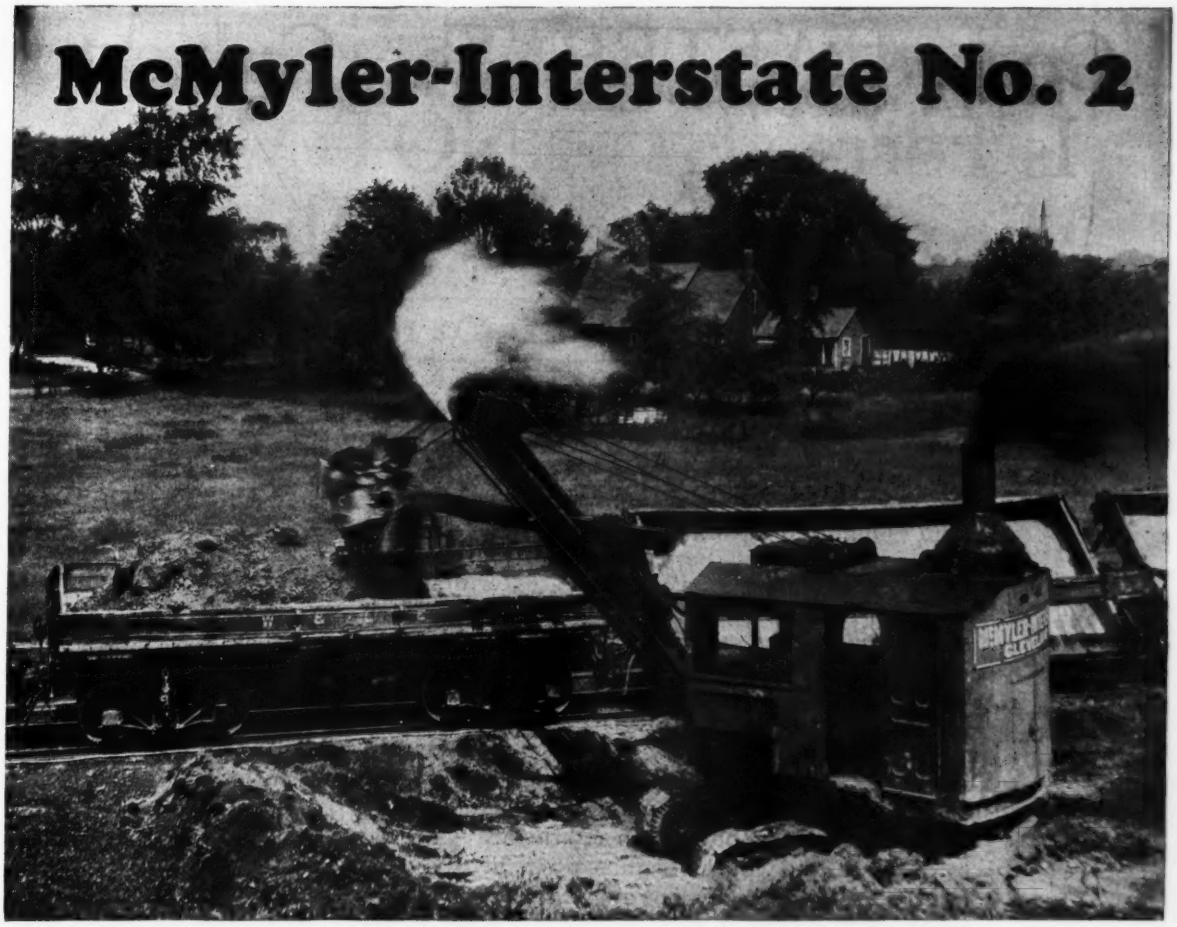
There is a manufacturer in almost every state and in Canada, making Culverts, Flumes, Siphons, Tanks, Roofing, etc., of genuine, rust-resisting Armco Ingot Iron. Write for full information and nearest shipping point on products in which you are interested

ARMCO Ingot Iron

ARMCO CULVERT & FLUME MFRS. ASS'N, Middletown, Ohio

ARMCO CULVERTS

McMyler-Interstate No. 2



No. 2 handles a larger dipper than any other shovel at or near its price. There is no mystery about this. No. 2 has more power and it has the strength to back up this power.

Main engine 6-inch bore and 8-inch stroke. Boiler 48-inches in diameter, 90-inches high, built for 150 lbs. pressure. And the weight is 60,000 lbs.

Check these figures against any other shovel—and then check the performance. Bulletin 68 gives further details.

C-2-99

Steam Shovels • Gas Shovels • Locomotive Cranes • Clam-shell Buckets

McMyler-Interstate

NEW YORK BUFFALO PHILADELPHIA PITTSBURGH **CLEVELAND** DETROIT CHICAGO SAN FRANCISCO LOS ANGELES

Coated AFTER The Culvert Is Formed • • NOT Made From Galvanized Sheets

THERE IS A GREAT DIFFERENCE

Thousands and thousands of feet of corrugated culvert pipe are today giving good service commensurate with their cost. They have been made of good materials. They have been formed from galvanized sheets of high quality.

But there are many places where greater durability and greater strength are required. For installations of this kind Wheeling Hand Dipped Culverts are recommended.

By the Wheeling process, the culvert is first formed from Ohio Metal (Copper Bearing Steel) *Black Sheets,* and there is no coating to be affected by the severe stresses to which these sheets are subject in forming. Not until the forming is entirely completed is the coating applied. Then the culvert section is immersed in pure molten zinc, and the heavy coating that adheres to surfaces and edges remains permanently, without crack or fracture. And the zinc coating is from one and one-half to two times heavier than is obtained by any other method. It is true that almost any desired thickness of coating can be applied to the culvert by this method.

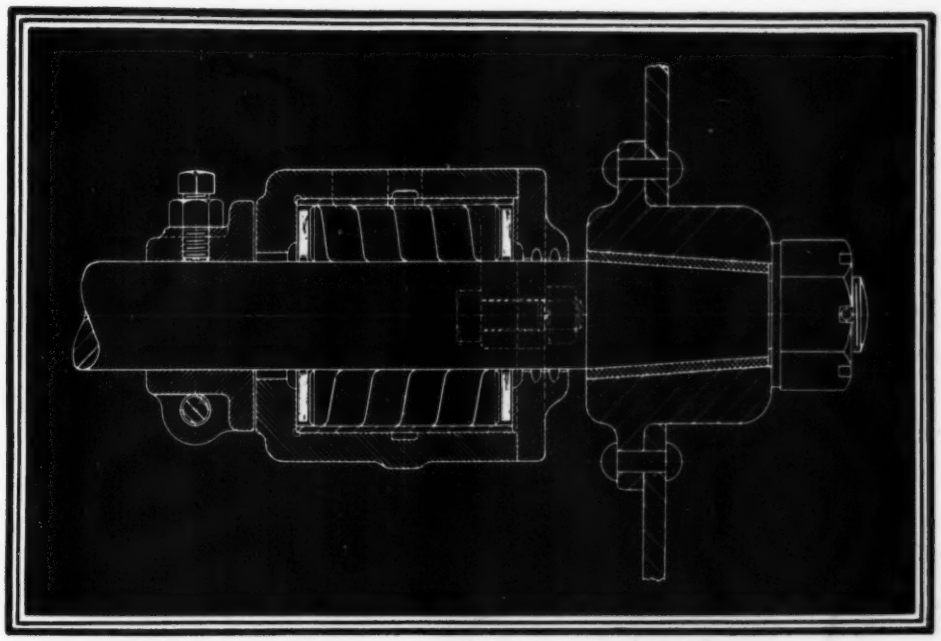
Here, therefore, in Wheeling Hand Dipped Culverts, is the added protection of a perfect heavy coating on an exceptionally durable and rust-resisting metal.

The difference is shown in detail by means of micro-photographs, reproduced in a folder which we will be pleased to send at your request.

WHEELING CORRUGATING COMPANY
WHEELING, W. VA.

NEW YORK	ST. LOUIS	CHATTANOOGA	MINNEAPOLIS
CHICAGO	KANSAS CITY	PHILADELPHIA	RICHMOND

Wheeling
HAND DIPPED CULVERTS



Typical mounting of Hyatt roller bearing in journal box for railway maintenance cars

Simple Construction Means Carefree Performance

THE characteristic simplicity of Hyatt roller bearings and the simple manner in which they are mounted are of basic importance to maintenance car builders and users.

There are no complicated parts to get out of order and no adjustments to make under any circumstances. Hyatt bearings operate for years with no attention other than occasional oiling—and without appreciable wear.

Coupled with easy running and substantial fuel economy, these qualities have made Hyatt bearing cars the recognized standard.

It is easy to get Hyatt equipment. Leading maintenance car manufacturers are prepared to furnish types of cars to meet all requirements, as well as Hyatt bearing replacement boxes for converting plain bearing cars.

Hyatt bearings are furnished for all classes of railroad equipment. Ask for information on passenger cars, freight cars, locomotive tenders and turntables.

HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO
WORCESTER PHILADELPHIA CHARLOTTE
PITTSBURGH CLEVELAND

HYATT ROLLER BEARINGS FOR RAILWAY MAINTENANCE CARS

RACOR

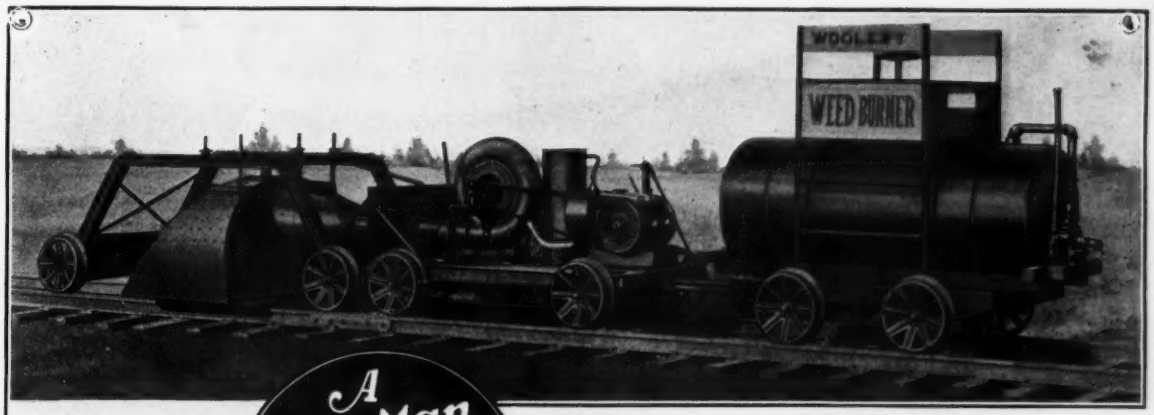
SEVEN WORKS
RAMAPO-AJAX-ELLIOT
HILLBURN, NEW YORK
NIAGARA FALLS, N.Y.
CHICAGO, ILLINOIS
EAST ST. LOUIS, ILL.
PUEBLO, COLORADO
SUPERIOR, WISCONSIN
NIAGARA FALLS, CANADA

HEAVY DUTY HEAT TREATED GUARD RAIL CLAMPS
DROP FORGED RAIL BRACES
ADJUSTABLE RAIL BRACES
EUREKA ADJUSTABLE CLIPS
MANGANESE REINFORCED SWITCH POINTS
RAMAPO AUTOMATIC SAFETY SWITCH STANDS
AJAX MANGANESE ONE-PIECE GUARD RAILS
SWITCHES – FROGS
CROSSINGS – SPECIAL
RAILWAY TRACK WORK

RACOR
TRADE MARK
REGISTERED

Main Office – HILLBURN, NEW YORK
SALES OFFICES AT WORKS, ALSO
30 CHURCH STREET, NEW YORK
McCORMICK BUILDING, CHICAGO

RAMAPO AJAX CORPORATION



A Two-Man Outfit of Guaranteed Efficiency
Average cost on first heavy burning less than $3.00 per mile

Woolery Railway Weed Burner

(Patent Applied For)

A self-propelled, three-unit outfit operated by two men. Speed from 1 to 5 miles per hour for burning, and up to 20 miles an hour for traveling. Compared with large and cumbersome machines, the Woolery is light—quick—nimble. Being easy to handle and quick to fire it gets around and can be used in places and on short burnings where other machines would be impractical. It may be removed from track at highway crossings. Total length of outfit, about 34 feet.

Note the clean, wide burned area that the Woolery leaves behind. In some places the weeds and crack grass had attained a height of 27 inches.

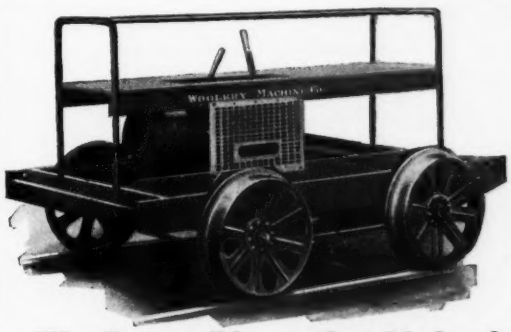
High Lights on the Woolery Weed Burner:

A Three-Unit outfit operated by TWO men.
Burns Gas Oil, Distillate Oil or Kerosene, and fire starts instantly.
ONE large Oil Burner—never whips out by tall weeds.
Burns a strip 11 feet wide.
Average burning rate, 2 miles per hour.
Fire may be shut off when crossing bridges. No drip of oil.
Fire relights automatically when fuel is turned on.
Outfit carries supplies for a full day's operation.
Any speed from 1 to 20 miles per hour on its own power.
Easily loaded on a flat car for long moves.
Operation is simple and easily learned.
All steel construction—safe and dependable.
Low fuel consumption, thoro work, and no train crew.
A clean, dry, withering hot fire—leaves no oil on the rails.
Four-Wheel Drive and Four-Wheel Brake—ample traction and safety.
Chrome Nickel Steel Ball-Bearing Axles—Strong and Easy-Running.
Entire workings of machine controlled from Driver's seat.
It may readily be removed from track at a highway crossing.

Always Ready for a Demonstration on Any Railroad

For Further Information, Write

Woolery Machine Co. Minneapolis, Minn.



The Woolery (Model M) Railway Motor Car

Light in Weight—100 Per Cent Overload

A car for every road—for any Climate—for all kinds of Service. Power to meet requirements. It can be used as Section Car, Extra Gang Car or Small Work Train. Normal Capacity, 10 passengers. Instantly removable side seats which increases the seating capacity to 20 men, can be supplied. Chrome Nickel Steel Ball-Bearing Axles. Steel Hand Railing and Lift Handles, Steel Engine and Wheel Guards. Steel Truss Frame contributes enormous strength.

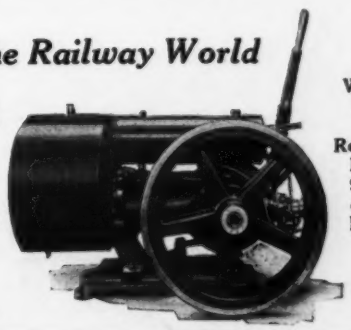
The Power Plants that Make the "Woolery" the Marvel of the Railway World

The Woolery Model "C" Reversible Engine

A powerful, light weight ball-bearing engine with speed control of from 400 to 1200 revolutions per minute. Develops 9 horse power on the brake test. Designed to use gasoline, but works efficiently on a mixture of kerosene and gasoline.

The Woolery Model "TC" Twin Cylinder, Reversible Engine with Two-Speed Transmission

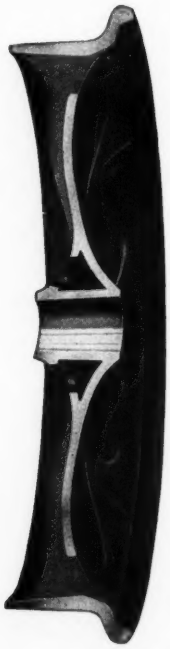
Ball-bearing, perfectly balanced, and smooth running. Develops 18 horse power on the brake test. Admirably adapted to the heavier class of section and construction work, and is powerful enough to save a work train many trips.



The Woolery Model "C" Reversible Engine 9 h. p. on the Brake Test

Write for Full Information and Detailed Description of Woolery Railway Motor Cars and Engines

The Woolery Machine Co., Minneapolis, Minn.



Sets a New Standard of Strength in Railway Motor Car Wheels

The Parsons one-piece, cast-steel wheel has twice the strength, three times the wear

GREATER strength than has ever before been put into a motor car wheel—that is the outstanding feature of the Parsons Cast-Steel Wheel.

Making a wheel strong enough to meet the requirements of heavy-duty motor cars, yet light enough so as not to make the car too hard to handle, has long been a serious problem for the railway engineer. But the Parsons Wheel meets both requirements.

Through the use of cast-steel, Parsons has made a wheel in one piece. This elimination of riveted construction was the first step in securing increased reliability. In the second place, the cast process made it possible to reinforce the wheel against strains. For example, the tread is thickest at the point where it rides the rail. And the flange is sufficiently heavy so that the worst stretch of curved or sandy track will never eat through it.

In short, Parsons has developed a wheel that can be relied on to outlast any motor car—to give trouble-free service at a lower cost per year—to make motor cars far safer than ever before.

Detailed information about Parsons Wheels is contained in our Bulletin 25-W. It includes the results of engineering tests of the Parsons Wheel, and photographs of service conditions on some of the seventeen transcontinental roads that are now using Parsons Wheels. We believe that every m. w. official will be interested in reading this bulletin, and having it on file. Copy sent on request.

THE PARSONS COMPANY, Newton, Iowa

PARSONS WHEELS

ONE-PIECE CAST-STEEL *for* **RAILWAY MOTOR CARS**

Railway Engineering and Maintenance

Volume 21 September, 1925 Number 9

GIVING THE MOTORIST A FAIR SHOW

ALL railway men have had their indignation aroused by the motorist who manifests an utter disregard of common rules of safety in approaching and crossing railway tracks. However, anyone who has driven a motor car has reason to appreciate the fact that signs provided to warn the motorist of the presence of a railway crossing are often none too conspicuous and that in night driving on a strange road it requires most careful vigilance to avoid missing some of these signs entirely. One of the most potent influences tending to decrease the driver's alertness in observing and obeying warning signs at highway crossings is to be found in the multitude of small advertising signs which border important highways almost from end to end, many of them constructed in such a way as to simulate warning signs even to the extent of using the word "stop" in large letters.

One of the most flagrant cases of this kind was recently noticed where a group of no less than 10 of these small signs of various sizes and shapes had been erected within 100 ft. of a railway crossing and had the effect of practically nullifying the value of the sign warning drivers of the presence of the highway crossing, if not actually concealing it. Maintenance of way officers should be on the alert to note these objectionable conditions and see that they are brought to the attention of public officers with authority to correct them.

IS THE INVESTMENT WARRANTED?

OF THE VARIOUS ballast materials commonly employed crushed stone is usually the most expensive in first cost. It is also the most difficult to surface track on. However, it affords a stronger track construction and will, therefore, stand up longer and better under heavy traffic. In fact, on the most dense traffic lines it is practically the only material which will carry the loads without excessive maintenance. It will do this, however, only as long as it drains freely, for as the interstices become clogged water collects and the ballast loses a large part of its efficiency.

Yet many instances can be found where roads have incurred the heavy initial expense for stone ballast and have then permitted it to lose its effectiveness in large part by becoming clogged with cinders and roadway dirt. This has been due in part to a failure to realize the extent to which the efficiency of the ballast is reduced by this neglect and in part to the high cost of removal of the dirt. Fortunately there has been a marked awakening of interest in the cleaning of stone ballast of late and this, in turn, has led to some progress in the development of methods for the employment of machinery to reduce this cost. As a result an increasing mileage of stone ballast is being overhauled each year, although an even greater mileage is still neglected. Considering the roads as a whole, this subject warrants still more attention if they are to receive the full return from the investment which they have already made in this ballast.

WHY SHOULDN'T ALL TIES BE TREATED?

DEMONSTRATIONS of the value of timber treatment have been presented in these columns so often that the editor sometimes questions whether a new record of the service life of ties brought to his attention can be classed as "news." He wonders if his readers are not so thoroughly convinced of the economy of timber preservation that they have ceased to take an interest in the reports of new service records. However, when he realizes that only about one-half of all the ties and only a relatively small proportion of all bridge timbers now being bought by the railways have been treated it becomes clear that the railway managements, if not the railway maintenance officers, have not been educated fully to the merits of wood preservation. There are, of course, heavy traffic tracks with sharp curvature on which the mechanical destruction of the ties is so rapid as to raise a serious question as to the economy of using treated timber. However, in most cases, it is not the lines with the heavy traffic but roads of light traffic that continue to buy untreated ties and timbers to fulfill the bulk of their requirements. Either timber preservation is right or it is wrong. The exceptions to any general rule necessarily concern only a small fraction of the total requirements and surely the ratio of the mileage of tracks on which treated ties are justified to the mileage on which they are unwarranted is not "50-50." Therefore, if the railroads have found it economical to have 50 per cent of their ties subjected to treatment, why are they not equally justified in making the proportion of treated timber practically 100 per cent? Are you doing your share to drive home the message of the economy of timber preservation?

WE ARE BETTER OFF

AS A RESULT of the war, the introduction of other modes of transportation and other conditions which it is unnecessary to discuss here, the railways of the world are generally in a serious predicament, many of them earning operating deficits from year to year. We in America are keenly alive to the financial difficulties with which our railroads are confronted and earnestly long for the time when the relation between earnings and expenses can be placed on a more sound basis. But when a comparison is made between conditions in the United States and Canada, and those in other countries, we have reason to feel fortunate. No-

where else in the world are railway officers and employees as well paid as they are on the American continent. Nowhere else is the standard of living of railway employees as high as it is here. It is also true that nowhere else in the world are railways operated with as small a number of men in proportion to the traffic handled or with as small a force per mile of track.

This does not mean that American railroads are under-manned or under-maintained. But it means that the men are employed more effectively. There are a number of reasons for this. With the higher standards of living, men here are better nourished and can do a better day's work. They are afforded greater opportunities for the exercise of initiative, for doing their work more intelligently. But the influence most largely responsible for the use of a relatively smaller force on the American railroads is the greater use of mechanical equipment designed to save manual labor. Wide as is the field for the further extension of labor-saving equipment in track maintenance the present extent of its employment on American railroads is far beyond that to be found anywhere else in the world.

This condition is not to be ascribed to a greater degree of intelligence and initiative on the part of American railway officers as much as to a basic difference between economic conditions here and elsewhere. In many parts of the world the use of labor-saving equipment is prohibitive, in spite of economic feasibility because of the serious consequences of any increase in an already large labor surplus which would result from its introduction.

There are those who feel that American industrial development is becoming top-heavy; that the campaign for increased investment for improvements designed to economize in labor is calling for an excessive overhead in capital and in the organization necessary for the manufacture, sale, supervision and maintenance of expensive equipment. But it is certain that few men in the employ of American railroads would like to change places with the employees of European or Asiatic railroads.

THE CREDIT BELONGS TO THE MANUFACTURER

ONE OF THE pertinent facts brought out prominently in the proceedings of the International Railway Congress at London last June, is the limited use made of railway motor cars by the maintenance of way forces of European railroads. This is a condition which might be ascribed primarily to lack of initiative on the part of the managements of European railways and railway supply manufacturers. But this position is not justified by the facts since the failure of the European railways to make greater use of the motor car can be explained largely by certain fundamental conditions. In the first place, a large part of the mileage of railways in England and France and other highly developed European countries is of multiple-track, heavy traffic systems, which compare favorably with the dense-traffic lines in the eastern part of the United States, where the use of motor cars is not desirable on account of traffic conditions and where the sections are so short as to make the cars largely unnecessary. It is also to be accounted for by the plan of organization of European maintenance of way forces and the manner in which maintenance work is conducted. Many of the railroads maintain their tracks under a plan whereby a general overhauling or "relaying" is carried out at stated intervals, the work in the intervening time being limited largely to policing done by small gangs and patrolmen. Moreover, in countries with dense populations and thickly dotted with small villages, there is no difficulty in providing headquarters for gangs or patrolmen at as short intervals as may be found desirable. Consequently, there is no occasion for transporting gangs long distances between headquarters, as is the case in the more sparsely populated sections of the United States and Canada. Another important influence is the plentiful labor supply and low wages which eliminate much, if not all, of the incentive for the introduction of any labor saving equipment. However, in offering this explanation there is no thought whatever of detracting from the credit which must be accorded to the American manufacturers of motor cars for the enterprise which they have manifested during the past 15 years or more, not only in the development and perfection of this valuable form of equipment but in their persistent promotion of it with the result that it is widely used today.

LUBRICATION

A railroad organization is a human machine or rather a group of machines. Each machine performs a definite function and they are all needed for proper service. There is friction in human machines just as in ordinary machines because men rub one another in their daily work. If these contacts are not properly lubricated, they become heated and the sparks fly.

Proper lubrication of human machines is more important than for those of iron and steel. If properly cared for, the human machine should not deteriorate but should improve in usefulness and efficiency with each succeeding year.

What then, is this lubricant? It is a carefully prepared mixture of confidence, courtesy, co-operation, fair play and human understanding which cannot be purchased with money nor can it be obtained without paying the price. We must remember that to secure co-operation, we must give co-operation and it is well to set a good example. ***From an address before the New York Railroad Club by R. E. Woodruff, division superintendent, Erie, Buffalo, N. Y.***

SUPERVISION OR TRAINING

WE HEAR much about the lack of adequate supervision today. Roadmasters, master carpenters and division engineers complain frequently that their territories are so large that they cannot cover them properly. There is undoubtedly much merit in this contention in many and probably most instances. Yet the question may properly be raised whether some of the supervision now given may not be misdirected or, in other words, whether supervisory officers are not burdening themselves unnecessarily with the detailed administration of their foremen's work rather than in training these foremen in the way they desire the work to be done and then leaving the details to them.

This statement is prompted by a remark made by a roadmaster recently to the effect that he could leave

his territory for a month at a time without his absence being evidenced in the work of two-thirds of his foremen and that he was concentrating his attention largely on the training of the remaining foremen in order that they might develop the same degree of self-reliance. This man has organization ability of a high order. While reducing the burden on himself, he is also developing foremen who will meet the problems as they arise from day to day more satisfactorily than it is possible for him to meet them with the limited attention which he is able to give the individual sections. His method may well be followed by other supervisors to their advantage and to that of the roads which employ them.

THE VALUE OF COMPARISONS

MORE THAN 16 cents of every dollar spent by the railways goes for the upkeep of their tracks and structures. Somewhat more than half of this amount goes for labor. This money is expended by a large number of gangs similarly organized and engaged in the same operations under similar conditions. This offers an excellent opportunity to make comparisons of the relative efficiency of different gangs. Yet relatively few roads have taken advantage of the opportunity to make such comparisons.

With an annual labor expenditure of more than fifteen hundred dollars per mile of road, made under the limited supervision inherent in work so widely scattered, it is highly desirable to develop means of stimulating efficiency by encouraging each individual foreman to improve his methods. The desire to excel is inherent in all normal men. The worth-while man will strive to equal and to surpass his associates if he knows what they are doing. Without this knowledge, however, he has no such incentive.

One of the objectives of the plan which the Frisco has developed to ascertain the relative production of different gangs, as described on a following page, has been the dissemination of the information collected so that each foreman may know what he and his associates are doing, and so that he can determine how the work of his gang ranks with that of other foremen. If low, the average man will endeavor to ascertain wherein he is deficient and strive to improve his record.

This comparison also affords supervisory officers a measure of the output of their various gangs, enabling them to identify and to aid those with the poorer records and to profit by the methods of the more efficient. The net result is the raising of the general average over the entire territory—a result much to be desired.

Plans such as this are worthy of study and emulation by many roads. The railways have been slow to adopt measures of this character although their merit has long been recognized in other industries.

THE CONVENTION SEASON

THE ROADMASTERS' Association will hold its annual convention at Kansas City, Mo., on September 22-24. The Bridge and Building Association will hold its convention at Buffalo, N. Y., on October 20-22. These meetings, treating as they do of the practical field administration of maintenance of way work, should be and are of interest not only to local division supervisory officers, but to system maintenance officers as well and an increasing number of each group is attending these conventions each year.

The meeting places of both organizations are centrally located this year. The working season has been as nearly normal as can be expected in any year for it has been singularly free of labor troubles, floods and other disturbing factors. It should, therefore, be possible for men to get away from their roads for a few days if they are so inclined.

The question then arises whether it is worth while for the man to make the effort and for his road to encourage it. The fact that the attendance at these conventions is increasing steadily from year to year indicates that it is worth while. It is difficult to conceive how a man intimately connected with maintenance of way work can fail to gain inspiration and new ideas from contact with a large number of men similarly interested and employed. Furthermore, the programs themselves, including reports prepared by men actually engaged in the problems under discussion, supplemented by addresses by executive officers of broad experience, bring out a vast amount of information regarding the newer and more important problems and their solution which cannot help but aid a man in the conduct of his work when he returns to his individual road. The wide-awake, ambitious man will endeavor to attend the convention of direct interest to him. Others should be encouraged to do so by their superior officers.

A WORTH WHILE PRACTICE

THE JOINT has long been recognized as the weak point in track construction. It is here that the largest amount of labor is expended for maintenance, a study made on the Pennsylvania a few years ago indicating that more than half of all labor expended for surfacing was required at the joints. It is here also that the deterioration of the rail occurs first and most rapidly, continuing until it requires the removal of the entire rail. Until recently the expedient applied most generally has been to remove the rails from the track, saw off the battered ends and start over again.

Of late years other methods have also received attention. One involves the building up of the battered ends without removing the rails from service by adding metal to fill up the depressions and thus restore the original contour. This is designed to repair rather than overcome the deterioration. Another method, which is described by C. A. Morse, chief engineer of the Chicago, Rock Island & Pacific, in an article published elsewhere in this issue, attacks the problem by endeavoring to overcome or retard the destructive action by replacing worn or deformed joints by new ones which provide new and firm support for the rail and restore it to its original position.

In the development of this practice Mr. Morse has attempted to determine what interval elapses under the traffic carried on the main lines of that road before the joints begin to batter. Having determined this period, he has been in a position to know approximately where to look for indications of deterioration, preparatory to renewing the joints. This method of attacking this problem has much to commend it as a means of not only increasing the life of the rail and thereby reducing the expenditures for replacement material, but also of reducing the amount of labor required to surface track to maintain it in proper riding condition when the joints begin to go down.

FATAL DERAILMENT IN FRANCE—On August 13 a passenger train was derailed at Amiens, resulting in the death of 9 passengers and the injury of 80 others. The accident was due to excessive speed through a crossover.

Letters to the Editor

A MODIFIED METHOD FOR STRING-LINING CURVES

Louisville, Ky.

To the Editor:

I have been interested for some time in developing a method of string-lining curves that would be simple enough to be generally applied. I have found that the method presented by H. L. Pierce, supervisor of the Pennsylvania, in a paper presented before the 1921 convention of the Roadmasters' association and published in the *Railway Maintenance Engineer* for October, 1921, page 383, and the method described by W. F. Rench in his book on "Simplified Curve and Switch Work" are rather more difficult than can .be handled by the average track supervisor or roadmaster or by

Effect of Resultant												Throws	
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18	-9	0 +4	13		5 8	5	2 1/4	18	14	2 2		9	
29	-9	0 +4	24		10 4	6	3 5/8	29	24	1 4		9	
36	+1	-6 +4	35		5 2	7	4 1/2	36	36	8			1
43	+13	0 -2	54		2 1 1	8	5 3/8	43	51	1 16			13
51	+5	-6 -1	49		1 3 1	9	6 3/8	51	51	2 8			5
54	+2	-3 -2	51		6 2	10	6 3/4	54	51	5 1 4			2
40	+6	0 -1	51		1 3 4	11	5 3/4	46	51	10 2 2			6
55	-1	-3 -1	50		2 1 8	12	6 7/8	55	51	5 4 1		1	
51	+3	0 -4	50		4 4	13	6 3/8	51	51	2 8 1			3
43	+9	+2 -1	53		9 2	14	5 3/8	43	51	1 16 3			9
60	-5	-2 -4	49		18 1 1	15	7 1/2	60	51	1 8 6		5	
45	+5	+2 0	52		9 3 1	16	5 5/8	45	51	2 4 12			5
54	+1	-2 -2	51		4 6 3	17	6 3/4	54	51	5 2 6	1		1
46	+5	+2 0	53		2 3 6	18	5 3/4	46	51	10 1 3	2		5
49	-5	+11 -2	53		1 1 13	19	6 1/8	49	51	5 1	4	5	
64	-22	+2 +5	49		26	20	8	64	51	2	2	22	
36	-10	+11 +2	39		13	21	4 1/2	36	36	1 1	1	10	
24	-4	-1 +5	24		6	22	3	24	24	2		4	
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Table Showing Method of String-Lining

the average engineer who does not have the time to study this subject thoroughly.

I have shown a method in the accompanying table which I have been using and which I have found can be generally introduced and handled by roadmasters and the better educated track supevisors. In this method the 31-ft. cords are measured off and the points numbered. The ordinates are taken with a 62-ft. cord, divided in inches or hundredths of a foot as desired and as shown in column A. A set of desired ordinates is decided on, using the spiral as developed by Mr. Rench, that is, using constants 1, 3, 6, 10, 15, 21, 28, etc. The difference between the existing and the desired ordinates is taken, doubled and run out, up and down, by taking half each time. The algebraic sum of the throws in and out is the net throw.

At the left of the sheet is the result, using the principle that the ordinate on each side of the point is affected half as much in the opposite direction, that is, each of the corrections given in the column marked C and D will affect the ordinates on each side half as much in the opposite direction. For instance, it is proposed to make a throw-out of 6/8 in. at station 11. If this were made, the ordinates at stations 10 and 12 would be reduced half as much as the ordinate at 11 is increased, that is, 3/8 in. By applying this correction to each point and taking the algebraic sum, the resultant ordinates are as shown in column E. This process smooths the line but does not entirely restore it to a circular curve, although if the track is not badly out of line, usually one such solution will give a practically perfect line. If desired, more than one solution can be applied.

The advantages of this system are that it is simple and results in the least throw for each point, that is, where it is applied to a curve the track will move out about as much as it moves in so that the process usually results in the best possible line. Of course, this leads to some complications at bridges, but for the most part it is entirely applicable.

J. R. Watt,
General Roadmaster, Louisville & Nashville.

NEW BOOKS

Proceedings of the American Railway Engineering Association.—Volume 26, 1925. 1,456 pages, 6 in. by 9 in. Bound in cloth. Published by the association, E. H. Fritch, secretary, 431 South Dearborn street, Chicago.

It is difficult to present a review of the annual proceedings of the American Railway Engineering Association, of which this is the latest, because there is little in these volumes to distinguish them from their predecessors other than that the material contained represents further progress in the study of railway operation, maintenance and construction by the hard-working committees of this association. This latest volume contains reports of 22 regular and two special committees and the discussion of these reports on the floor of the convention. By way of illustrating the character of the material contained in this volume, the following subjects have been selected at random from the reports of the various committees: The use of lead and its substitutes in making the joints in cast iron pipe; methods of curing slides and water pockets in railway roadbed; standard plans of frogs, switches and crossings; a report on the canting of rail, which conclusively recommends the adoption of this practice; organization and methods of doing various classes of work; the programming of work, etc.

A Three-Foot Box Culvert Constructed of Creosoted Wood in 1897

Concrete Cribbing Replaces Wall

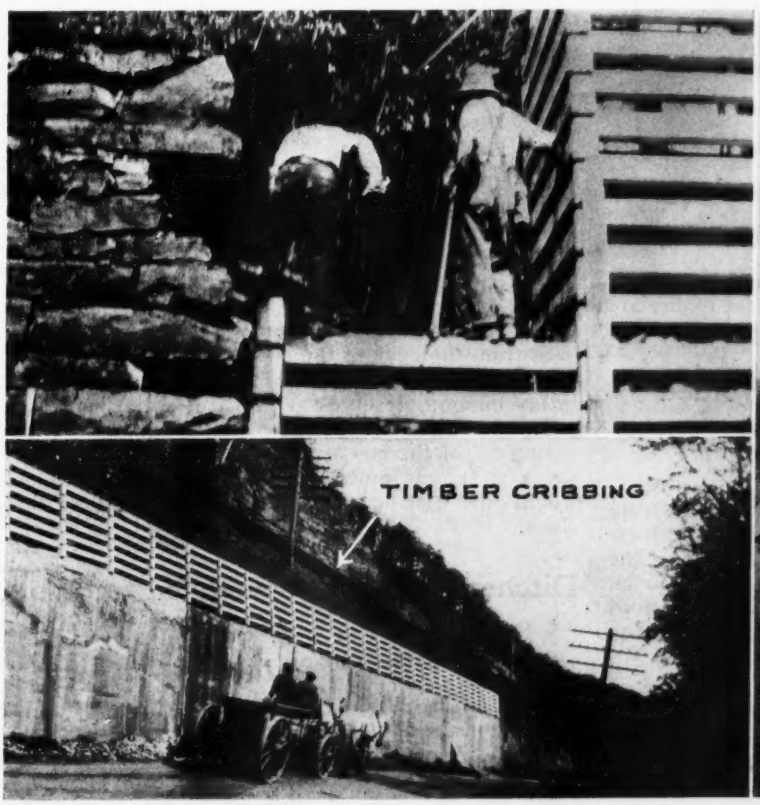
This Form of Construction Afforded Economical Solution of Difficult Problem

By R. L. Dyke
Division Engineer, Erie, Hornell, N. Y.

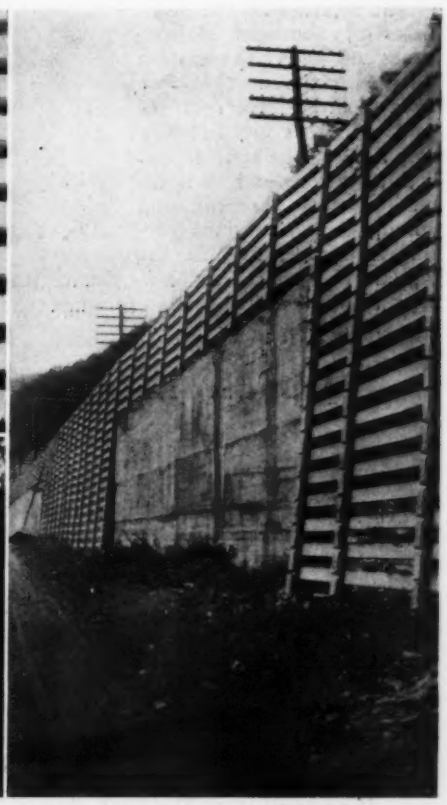
AT WHAT is known as Waverly Narrows, located about one mile west of Waverly, N. Y., the Erie has just completed the replacement of a portion of an existing stone retaining wall by the use of reinforced concrete cribbing. For a distance of about 2,700 ft. the embankment supporting the railroad tracks at this location is held in place by a stone retaining wall averaging from 10 to 20 ft. in height. The tracks at this point had been raised from time to time on cinders and strippings from a nearby gravel pit which had made it necessary to widen the embankment and to place timber cribbing along the eastbound track or to raise the retaining wall to the height necessary to take care of the slopes. From time to time parts of this wall have been replaced with a concrete wall constructed to the same height and so built that at some future date, when it becomes necessary to renew a greater portion of the wall, the concrete wall can be raised to a sufficient height to take care of the natural slope of the embankment without the use of the timber cribbing.

Following an inspection of the wall in the spring of 1924 it was decided that about one-third of the old stone wall should be renewed at that time, and in making this renewal, that the wall should be carried to the height necessary to take care of the slope without the use of timber cribbing and that the existing concrete wall should also be raised to the proper height by placing concrete units on top of it.

Test drillings showed that the fill was made almost entirely of loose rock, with only a small amount of earth fill on top of the rock. The use of cribbing was therefore decided upon for the replacement of the stone wall and also the timber cribbing until such time as the rebuilding of the wall is required when it can be brought to the proper height. In rebuilding this wall with concrete cribbing care had to be taken to arrange the construction of the solid crib wall so that the headers and stretchers would join up correctly with those used on top of the concrete wall. At some locations stretchers of special length were used. The concrete cribbing was laid on a batter of two inches to the foot while the batter on the existing concrete wall is one inch to the foot. To get a well matched job, it was necessary to so arrange the work that the batter line of the crib wall



Replacing the Stone Wall With Cribbing One Panel at a Time Concrete Cribbing Was Placed on Top of the Concrete Wall. Note Timber Cribbing Adjacent to Track



A Portion of the Completed Wall Showing How the Cribbing Joins the Solid Concrete

A Portion of the old Stone Wall in the Foreground With Concrete Crib Wall and Concrete Wall in the Background

would intersect at the level of the top of the concrete wall, making a uniform line at this point.

The concrete units for constructing the wall were received in carload shipments at Waverly freight station where they were unloaded into the material yard and later, as the work progressed, were taken to the site of the work by trucks and so distributed that they could be placed in the wall with a minimum amount of handling.

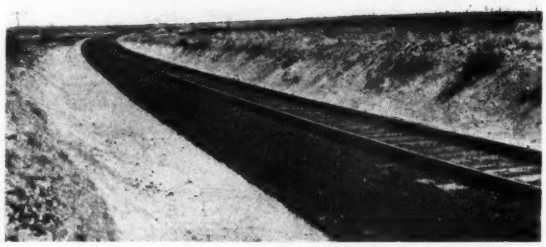
The bank was held while the wall was being renewed by placing "dead men" along the shoulder of the westbound track to which were fastened 7/8-in. cable which were passed underneath the tracks and down the embankment to 8-in. by 16-in. timbers. Sheathing was driven into the embankment back of these timbers to hold all loose material in place.

Only sufficient material was removed at one time to permit the construction of one crib unit and the greater portion of the material removed from the old wall was used to back fill in the cribs. At this time 730 ft. of the stone wall was replaced and 700 ft. of the existing concrete wall raised from four to six feet by placing concrete cribbing on top of the wall. The drainage from the northerly or upper side of the tracks was taken care of by placing suitable cross drains which were carried down back of the wall and under the highway to the river.

The material used in the construction of the wall was purchased from the C. F. Massey Company, Chicago. The work was handled by division forces under R. Pierce, master carpenter, and the writer.

What Constitutes an Effective Ditch?

ONE OF THE questions which came up for consideration at a recent meeting of the Kansas City Southern Maintenance of Way Association referred to the most efficient form of ditch under various soil and other right-of-way conditions. The subject was actively discussed by a number of those present and among the discussions presented and printed in the bulletin of this association for the month of May, 1925, were those from five section foremen whose replies are abstracted below:



Blockades Should Be Avoided

By Lee Baker
Section Foreman, Marble City, Okla.

An effective ditch should be at least eight feet from the end of ties to the back of ditch (where the location permits a ditch this wide) and the bottom of the ditch at the back side should be at least 12 or 15 in. below the base of the ballast section. This will afford good drainage of the track, thus keeping the roadbed dry.

In rock cuts where one must deal with layers of rock and where it is impossible to construct the ditch properly, it should by all means be lowered enough to dispense with all water from the roadbed and should also be dug as far back from the track as the rock will permit. If on level track the ditch should be dug somewhat lower at each end of the cut than in the center. In side cuts or around bluffs where the country is very rough, there are or should be waterways under the track to drain all water coming from the mountain; this being the case, the ditch should be dug in both directions from these waterways and care should be taken to give these ditches a continual slope to the roadbed drains.

Foremen should exercise great care never to allow any low places to be left in the ditch as they will inevitably cause a puddle or basin.

A high land ditch or surface ditch should be made and maintained on all cuts where the hillside continues to rise above the cut and should be at least 10 or 15 ft. back from the edge of the cut and of sufficient size to dispose of all water flowing towards the track. This, in my opinion, deserves as much attention and is as practical as the lower ditch because it eliminates much caving off of the cut by washes and in the meantime saves an undue amount of time and money which would otherwise be spent in keeping the roadbed ditch clean.

Ditches Should Be Extended to Outlet

By J. W. Ross
Section Foreman, Pittsburg, Kan.

The sub-grade should be shaped through all cuts the same as on the fills. If fills are to have an 18-ft. crown, the same crown line should be maintained through the cuts with the cut ditch deep and wide enough to carry the water at all times, without allowing the water to overflow the sub-grade. The cut banks should be sloped according to the kind of material in them. This, I think makes a much stronger roadbed

through the cuts and enables us to maintain the same ballast line through the cuts as on the fills.

I do not think the ditch should stop at the end of the cut, but should be extended to the first water opening. That part of the ditch between the cut and the water opening should be dug to engineer's stakes, paralleling the fill at least ten feet out from the toe of the fill, material from which should be used to make a berm bank against the fill. No water should be permitted to stand on the right-of-way.

Ditch Should Be Well Removed from Rail

By J. H. Reed
Section Foreman, Merwin, Mo.

Where possible, the back of the ditch should be 16 ft. from the ball of the nearest rail. It should begin at the toe of the ballast section and slope down on a gradual incline about eight inches to the heel of the ditch. The space between the ballast and the ditch should be scalped of all vegetation back to the ditch, but no scalping should be done on the banks in cuts, as the vegetation prevents the banks from sliding in to a great extent, especially in freezing and thawing weather.

Through some of the deeper cuts a minimum distance from the rail of 16 ft. cannot be attained. In such places the ditch should be put back as far as the time and allowance on such work will allow. In such cuts, all surplus dirt should be loaded up and either hauled out by work trains or trucked out and dumped on the fills where it can always be used to great advantage. Of course, if the amount to be moved in the cuts is too great or has to be trucked a great distance, it should be handled by work trains and ditchers.

Proper consideration should always be given to the proper direction of the water shed and one should not try to run water too far with little fall; such ditches soon fill up on account of the water running slow and failing to keep the loose dirt washed out.

Type of Ditch Depends on Conditions

By I. D. Allinder
Section Foreman, Noel, Mo.

On ground that is solid and drains well, the standard "V"-shaped ditch is the best for two reasons: (1) it affords good drainage and (2) it leaves the roadbed well braced until the track is solid.

On ground of a wet nature that does not drain easily, I believe the ditch should be wider to keep the water farther from the track with a steeper slope so that the water will run off quickly from the roadbed to the bottom of the ditch.

In squeezy ground our standard ditch, together with under-track drains has proved the best, but where a rock drain is used there should be a good track ditch on the surface to carry the surplus water away quickly and all low places on the right-of-way that collect water should be drained.

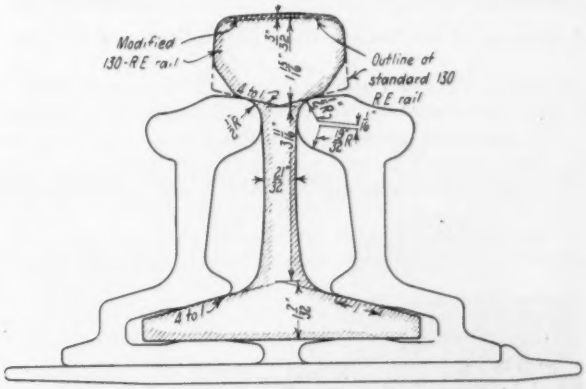
At places where surface water from adjoining land floods or overflows on the right-of-way, we should have a surface ditch some 25 ft. from the track to carry this water, where it is necessary to run the water parallel with the track. This should be a square ditch of sufficient size to answer the purpose where needed.

At places around bluffs or hills, the ditches should be widened from time to time as we go through them until they are standard, but for appearance all track ditches should be as near the standard cross section as it is possible to make them.

Reading to Try New Rail Section

THE READING Company has recently ordered 10,000 tons of 130-lb. rail for an experimental or trial installation, the rail being of a modified type of 130-lb. R. E. section for which numerous advantages are claimed. These advantages cover such factors as better rolling, better texture in the steel, a greater depth of head and longer rail life. The new section has been developed by the Thompson Rail Corporation of New York, the design being in some ways the result of the development and use of the "head free" type of joint manufactured by the Rail Joint Company.

In the head free joint the fishing surfaces of the head of the rail are not utilized in securing a bearing for the joint bars, the upper section of the joint bar next to the rail being curved to fit into the ½-in. radius fillet between the web and the head of the rail, the joint bar securing its bearing by pressure against this fillet and the 4 to 1 slope of the base of the rail. Thus there is no necessity for the fishing angle under the head of the rail whenever used in conjunction with any fillet bearing type of joint and the metal which is used to produce the fishing angles



The New Section in Relation to the Joint Bars

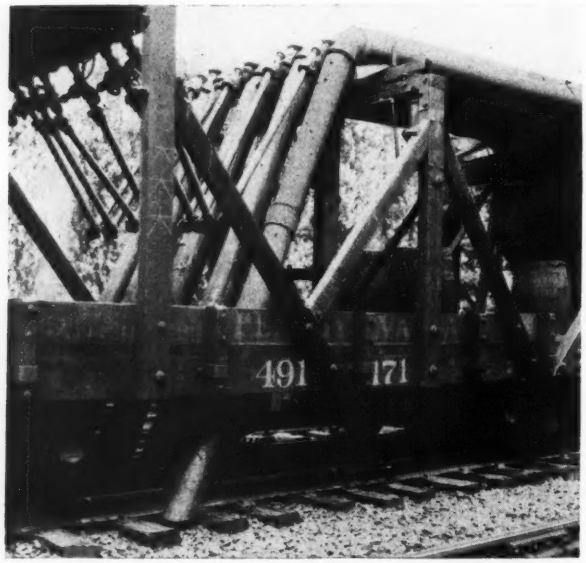
and the lowed corners of the rail could be eliminated or used elsewhere.

In the new rail section, the corners produced by the fishing angles and the sides of the rail were eliminated and the metal thus saved was added to the head of the rail, giving it an increase in depth of head of 3/32 in. This change likewise increased the height of the rail by the same amount. The remainder of the section is exactly the same as the standard 130-lb. R. E. section. The area of metal taken from the lower corners is 0.27 sq. in. The principal factors of design are shown comparatively as follows:

	Modified	Standard
Moment of inertia	79.18	77.40
Section modulus, head	20.84	20.80
Section modulus, base	26.05	25.60
Height of neutral axis from base	3.04	3.03
Area in sq. in.	12.68	12.71
Weight per yd. in lb.	129.41	129.71

Pennsylvania Cleans Track With a Suction Machine

THE PENNSYLVANIA has recently developed an interesting machine for use in cleaning track. The new unit is operated upon the suction principle and picks up all dirt and cinders upon the track and even down into the ballast, the suction being so strong that at times it picks up the loose ballast. It is operated by a locomotive at speeds



A Close-up of the Suction Pipes in the Operating Position

of from one to two miles an hour, the locomotive furnishing the steam which is used to create the suction.

The apparatus consists of a flat car on which there has been erected a timber support which carries a series of 8-in. pipes leading from the surface of the roadbed up and back over the end of the flat car. There are seven suction pipes, five inside the rails and two outside. The rear ends extend beyond the end of the flat car and discharge the dirt picked up into a hopper car which is coupled to the flat car. The hopper car is covered with a roof so that the dirt is retained instead of being blown out over the right of way. When one car is filled the roof is removed and placed on another.

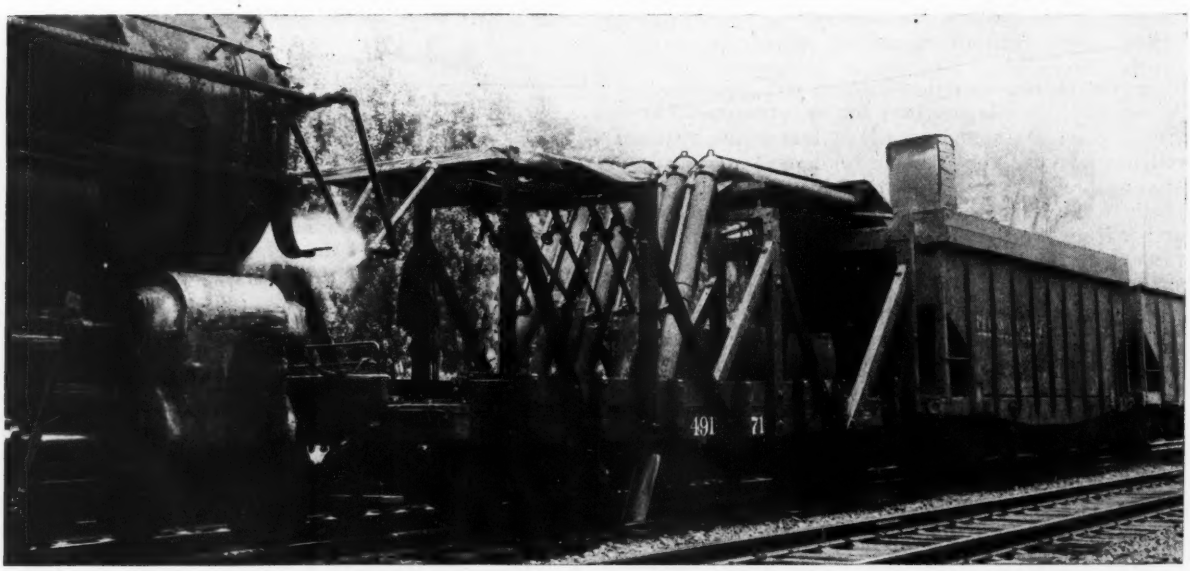
For the operation of the car, an H-8 type of locomotive is used, which has a 2 1/2-in. steam line leading from the steam dome forward to the front end of the smoke box. It is connected to two lines leading to a header placed across the car and from which smaller lines, valve controlled, run to the suction pipes. The steam is fed into the upper leg of the suction pipes through 11/16 in. nozzles at a pressure of from 165 lb. to 175 lb. The steam blowing into the pipes at this pressure creates a suction which lifts the dirt from the track and pulls it up the pipes to where the steam enters and is then blown ahead by the steam. All connections between the engine and the suction pipes are fitted with flexible joints. The entire unit can be uncoupled in a few minutes' time. The suction pipes are raised and lowered by means of two air cylinders mounted on the timber supports.

A Foreman and His Men*

By A. C. FARROW
Section Foreman, St. Louis Southwestern, Malden, Mo.

WHEN ONE has learned the principles on which the relationship between a foreman and his men should rest, he has settled one of the main questions which determine the extent and the success of the work which he may be able to accomplish. In considering this important question of relationship the foreman must realize that first of all there must be a basis of understanding. Without this many efforts at work will prove futile. No man is able to give his best efforts to any task unless he understands his employer and knows what is expected of him. For this reason, in order that the highest degree of efficiency may be obtained, the respective

*An abstract of a paper read at the fourth annual meeting of Sanitary and Maintenance of Way department employees of the St. Louis Southwestern at Paragould, Ark., on June 25, 1925.



The Suction Apparatus Coupled-Up Ready for Use

duties of the men should be clearly defined and each man informed as to what is required of him. In this way the foreman is establishing a relationship with his men in which is felt a definite chain of responsibility.

In the relationship with his men the foreman should enforce strict discipline when necessary, but should be careful to exercise judicious and skillful tactics in his management. The understanding which forms the foundation of the relationship between the foreman and his men should be based on trust, faith, and respect of the foreman toward his men and the men toward the foreman. It is not enough that the employees trust the judgment and actions of their foremen, and have faith and respect for his desires and commands, but it is just as necessary that the foreman realize that the men who are serving him are worthy of his highest trust, respect and confidence. In order for the foreman to merit the respect and trust of his men he must have confidence in himself and certainty of the success of his undertaking.

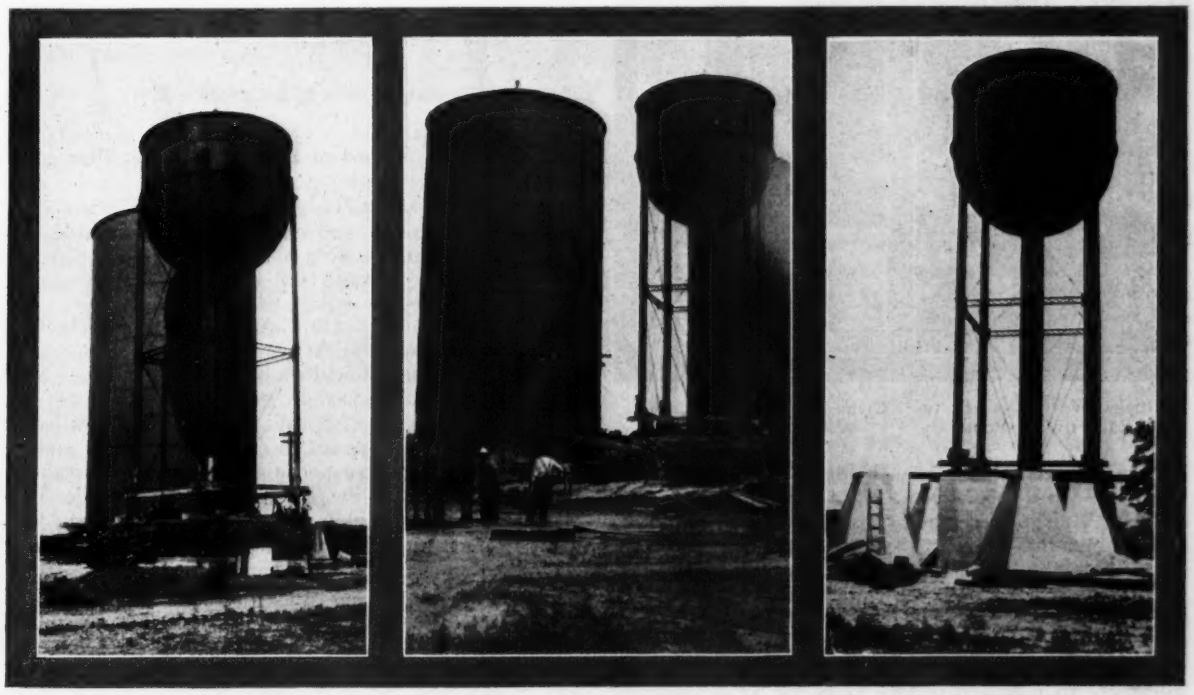
In addition to the other requisites, it is necessary that the foreman shall deal honestly, frankly and honorably with his men at all times, and possess the quality of being fair, just and impartial. When this relationship exists each feels free to exercise his opinions and offers suggestions to be discussed and considered to make his section the best section on the road. It is when this relationship prevails that the men work not merely to see that day finished and payday one day nearer, but with a real joy in their efforts, and in that way they are accomplishing something really worth while. By adopting this method the foreman not only secures the greatest personal efficiency from his men, but he also eliminates the discontented and necessarily inefficient employee whose mind is often fixed upon grievances when it should be concentrated on his work.

Moving a 100,000-gal. Steel Tank a Quarter of a Mile

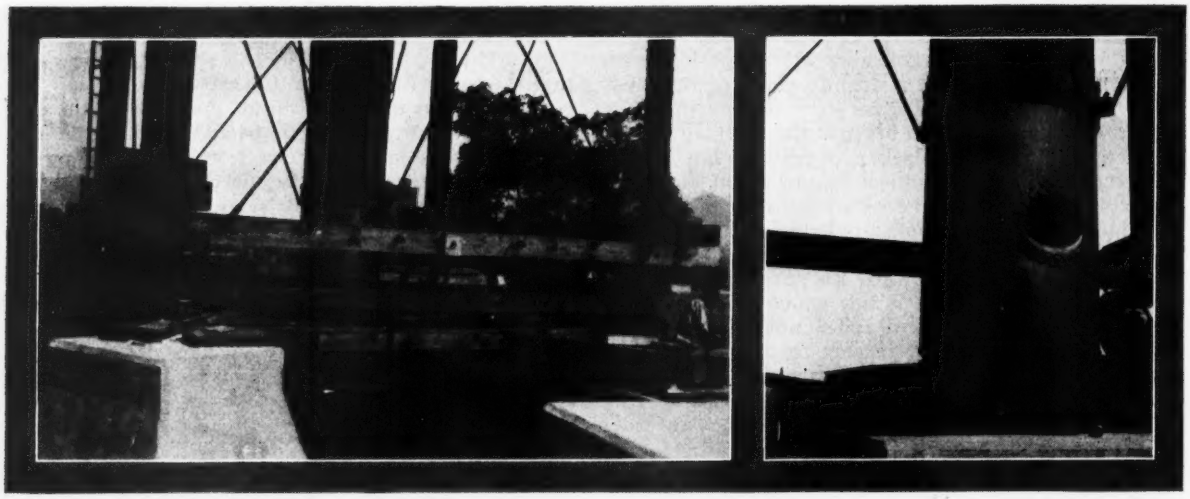
By J. D. Keiley
Supervisor, Chesapeake & Ohio, Russell, Ky.

IT BECAME necessary recently to move a 100,000-gal. elevated steel water tank approximately one-quarter of a mile in the terminal at Russell Ky., on the Chesapeake & Ohio, owing to the fact that it was in the way of one of the walls of a new roundhouse. The tank rested on piers seven feet above the ground. The distance from the base plates of the supporting channel columns to the top of the tank was 69 ft. 11 in. and the diameter of the tank 29 ft. 7 in. The tank was moved from its old location across two yard tracks to a new location, a distance approximately 1,200 ft. Advantage was taken of the moving of the tank to elevate it on piers 12 ft. above the ground to get needed increased pressure.

One of the first problems which arose was the necessity of supporting the riser pipe, which measures 4 ft. in diameter and is 44 ft. 3 in. high. This riser pipe is riveted to the bottom of the tank. To take the strain off it and to carry the water pipes inside the riser a band of 2-in. by ¾-in. steel in four



Ready to Start. On the Way to the New Location. On the New Foundation

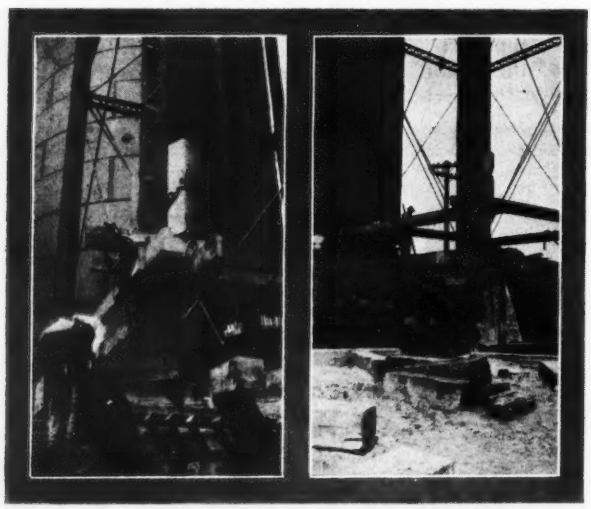


The Legs Were Rigidly Cross Braced

The Riser Pipe Was Supported by Steel Rods

sections was clamped around the riser. Each quarter of the clamp was bolted together directly opposite a leg of the tank. Rods 1½ in. in diameter were attached to the clamp bolts and extended half way up each tank leg, to which they were chained. The weight of the riser pipe as well as of the water pipes inside was taken up by a turnbuckle in the middle of each rod. These rods served the dual purpose of supporting the riser pipe and preventing it from swaying during the jacking and moving of the tank.

The four tank legs were then cross braced four feet above the base plates, with 3-in. by 10-in. timbers to prevent the legs from springing apart at the



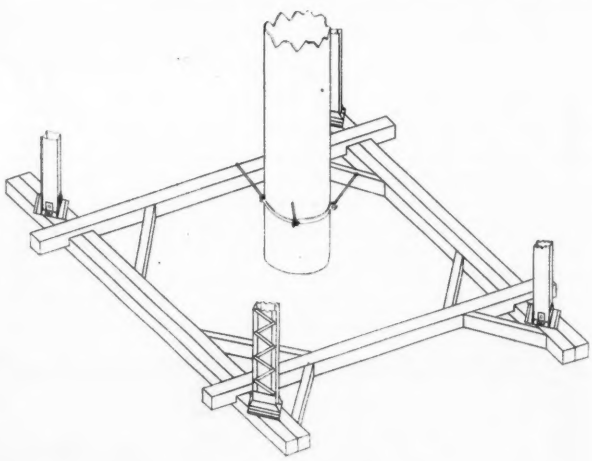
Blocks Were Chained to Each of the Posts

Cribs Were Built Level With the Pedestals

bottom while the tank was being loaded on its running frame and to provide a rigid body against which to jack. Blocks were then chained on each leg above and against this bracing to prevent the bracing from slipping up the legs while the tank was being jacked.

Following this, jacks were placed under the braces and blocks and the tank jacked see-saw fashion. The first side was jacked 4 in. and each side thereafter was jacked 8 in. at a list. The base plates of each side were then bolted to two 12-in. by 12-in. running timbers.

Cribs were built and the tank moved off the piers and lowered within 18 in. of the ground. Horses were used in moving the tank, pulling against a



Sketch of Method of Bracing the Riser Pipe

"dead man." On reaching the new location the tank was jacked up 12 ft., run onto its new foundation and bolted in the same way as on the old foundation.

MANY TRACK GAGES IN AFRICA—The widely different railway gages in Africa, while they have not yet caused any serious difficulties because the railways have grown for the most part in groups which are not yet connected, will, as the railways expand and the different systems become connected, become increasingly embarrassing to efficient transportation, according to a correspondent writing in the Times (London) Trade Supplement. Roughly speaking, the principal gages employed in Africa are three in number, standard, meter and 3 ft. 6 in. Standard is largely used in the north, meter in the great French possessions in West Africa and 3 ft. 6 in. in South Africa. There are, moreover, important areas where the 3 ft. 6 in. predominates elsewhere, as, for instance, in the British colonies in West Africa and Sudan, and the meter gage predominates in large sections of East Africa.

A Practical Method of Collecting Maintenance Cost Data

How the St. Louis-San Francisco Keeps a Check on the Performance of the Various Gangs

By Carl P. Hoff
Assistant Engineer, St. Louis—San Francisco, St. Louis, Mo.

IN SEPTEMBER, 1920, Colonel F. G. Jonah, chief engineer of the St. Louis-San Francisco, presented a paper before the convention of the Roadmasters' and Maintenance of Way Association, in which he described and explained the methods that the Frisco Lines had adopted to secure data on section and extra gang labor and how it was expected to increase the efficiency of track labor by this means. Colonel Jonah's paper was published in *Railway Engineering and Maintenance* for October, 1920, page 393. The method as described covered the use of the monthly time book by the foreman, this book being provided with blanks and headings which enabled him to make entries each day indicating by the accounts or subdivisions of accounts, the nature of the work that was done by the gang, the labor cost applied to each class of work and the amount of work done. The amount of work was expressed in various terms, depending on the nature of the work. Thus surfacing, ditching, weeding, rail renewals, etc., were recorded in track feet, tie renewals by the number of ties, unloading ballast in cubic yards of ballast, etc.

The time books were turned in semi-monthly to the system bureau of accounts where the information contained was assembled for study and use. The primary compilation was in the form of a grouping of sections for each roadmaster's sub-division with a second grouping giving the total work done and the average cost for each classification for each roadmaster's district and similar figures by divisions and for the entire system.

The Purpose of the System

The object of these reports and the tabulations made from them is to provide first-hand reliable information on the cost of doing maintenance work, to afford a check on the relative efficiency of the various gangs, sub-divisions and divisions, to provide opportunities for a study of the most efficient methods, to assure control over the distribution or allotment of the available time for the various classes of work, etc.

This system of obtaining data on costs and the application and use of the data has been broadened and extended since the method was described by Colonel Jonah. Changes in the accounting system of the Frisco lines during 1923, which included the establishing of division accountants at each of the operating division headquarters, have made it possible to have each division's data consolidated and compiled in the division offices. The present practice eliminates considerable delay, and clerical errors have also been eliminated to a great extent. At the time of the change to division accounting, some revisions were also made in a few of the forms in order to incorporate in them some desirable features that were the natural outgrowth of the use and application of a system of this kind.

The methods that are followed to collect and apply the data on section and extra gang labor have proved their worth by use and are no longer a matter of plans but of actual practices. A general explanation of the current methods and results follows:

The foremen are provided with a pocket time book which covers one month's work. This book, which the foreman keeps on the job at all times, contains instructions as to the reports he is required to make out. The pages of the book provide conveniently arranged forms for recording each day the necessary data for his reports. This book has been carefully worked out and the success of the system is largely due to it, as its practical arrangement has evidently appealed to the foremen.

The Foreman Must Make Out a Daily Report

During the day the foreman records in the book, on the page for that day, what the gang does, the number of units of work done, and the number of hours of labor spent on each item of work. At the close of each day he makes out a daily report of time, copies of which are sent to the roadmaster and division superintendent. He also makes a "daily labor distribution report" on the form provided (Form MW 140 A Standard). This lists the items of work for which the units of work are to be reported, together with the hours of labor spent on each particular item. On certain items of work only the hours of labor are reported as these cover work on which it is not practical to report comparable units.

The use of the daily report is one of the principal changes that has been made from the system that prevailed in 1920. The daily report has been found practical and very desirable. The items of work listed on it are the result of experience in collecting data of this kind over a period of several years. Originally, data were collected on a number of other items of work but it was found that the most essential data could be secured at a considerable saving of time by listing a smaller number of specific items of work.

Data Assembled On "Condensing Sheet"

When the daily labor distribution reports are received at the superintendent's office, a record is made on a "condensing sheet" (Form MW 150 Standard). This work is done by a clerk under the direction of the division accountant. One condensing sheet is kept for each section or extra gang, and the sheet is so arranged that at the end of each seven-day period of the month, the total labor cost on all the items of work can be readily determined. The advantage of this feature to the supervisory officers is obvious.

At the end of each month the division accountant, by use of the "condensing sheet" for each section, arrives at the average labor cost per unit of work and the distribution of labor to the various items of work, etc., for that particular section The data for all the sections on one track division or roadmaster's

territory are then assembled on one sheet and copies of this are sent to the division officers.

A similar monthly report is prepared by the division accountant for the entire operating division, which contains a separate column for the summaries of each "track division" or roadmaster's district as well as for a summary for the entire operating division. The division summary is also shown separately on another form as illustrated. This lists 18 items of work for which there are shown the "number of units," "total hours of labor," "total cost of labor," and "average cost per unit of work." There are also shown 14 specific items of work for which only the hours of labor are reported. The total hours of labor for the month, together with the total cost of labor, and the average cost of one man hour of labor are also shown. This report has four columns for the purpose of comparison. One gives the data for the "current month," while the others show the corresponding figures for "last month," "same month last year," and "total this year to date." Copies of the division's monthly summary go to the general manager, chief engineer, division superintendent, and division engineers.

TRACK FOREMAN'S DAILY REPORT OF LABOR DISTRIBUTION

Division_____ Track Division_____ Date Report Covers_____ 19____
(MONTH) (DATE)

Location_____ From M. P._____ To M. P._____ Section or Extra Gang No._____

I. C. C. Acct.	Unit Cost No.	DESCRIPTION OF WORK	Trk. Letter	Unit	NUMBER UNITS	HOURS NOT JOINT	HOURS JOINT	JOINT WITH (Name of Railroad or Industry)	MILE POST LOCATION FROM M. P.	FROM FEET	TO M. P.	TO FEET
202	1	Grassing Track and Cutting Sod Line		Track Foot								
"	2	Mowing and Burning Right of Way		"								
"	3	Dressing Ballast Shoulder		"								
"	4	Cleaning Ditches										
"	5	Patrolling Track										
"	6	General Yard Cleaning										
208	7	Bridges Trestles and Track Culverts										
218	8	Unloading Ballast		Cars								
220	9	Applying Ballast		Cu. Yd.								
"	10	Inserting Ties In Ballast		Each								
"	11	Lining and Surfacing Track out of Face In Ballast		Track Foot								
"	12	Inserting Switch Ties		L. Foot								
"	13	Laying Rail		Track Foot								
"	14	Spotting Track		Rail Length								
"	15	Applying Tie Plates		Each								
"	16	Tightening Bolts		Joints								
"	17	Repairing Frogs and Switches										
221	18	Repairing Right of Way Fences										
"	19	Repairing Cattle Guards and Wing Fences										
225	20	Repairing Public and Private Crossings and Signs										
227	21	Care of Station Grounds and Buildings										
240	22	Caring for Signals and Interlockers										
373	23	" " Switch Lamps outside Yards										
404	24	" " Signal Lamps										
370	25	" " Switch Lamps Inside Yards										
405	26	Watching Crossings										
		Describe below other roadway and track work not listed above.										
		NEW WORK AFE NO._____ Description_____										
		Grading										
		Drainage										
		Unloading Ballast		Cars								
		Track Laying and Surfacing										
		Fences and Cattle Guards										
		Road Crossings										
		Placing Signs (Kind)		No.								
		Taking up or Moving Existing Tracks										
		Unloading Material for New Work										
		Picking up Material upon Completion of Job										
		TOTAL HOURS										

(Follow Instructions in Pocket Time Book, Form M. W. 23 Local.)

The Foundation for the System Is the Foreman's Daily Report

Under the direction of the chief engineer a monthly summary for the system is prepared from the monthly summaries of the various divisions. On the monthly system summary the data are condensed so as to require only a letter size sheet. This form shows the number of units of work on the various items, the system average unit costs, the total hours of labor for each item, and the per cent of the total hours of labor expended on the various items of work. An analysis is made of the report of each division, and also of the system summary, and copies are sent to the vice-president in charge of operation, general manager, assistant general managers, and division superintendents. The division officers upon receipt of the reports for their divisions take up promptly with their roadmasters such details of their work as are indicated by the reports to need attention.

Advantages to Be Gained

The present system permits a close supervision of the results of maintenance labor. The cost of a man-hour of labor has reached such a figure that intensive and detailed supervision is justified. The Interstate Commerce Commission's maintenance of way accounts include material as well as labor. One of these accounts, in many instances, includes more than one item of maintenance work. By having maintenance work divided into items of work that are familiar to the section foreman and track forces, reasonably reliable reports can be secured as to the unit cost or the total cost of labor on any particular item. This gives a definite basis for increasing efficiency, and a reduction in labor cost can be effected.

One of the results of this system so far has been to bring out in a definite way the relative importance of the various items of work from the standpoint of labor

CONDENSING SHEET—LABOR DISTRIBUTION—TRACK DEPARTMENT

Division____ Road____ State____ Track Division No.____ Section or Extra Gang No.____ Month of____ 19____

I.C.C. ACCT. NO.	202							208	210		220									
UNIT COST NO.	1	2	3	4	5	6	OTHER HOURS	7	8	OTHER HOURS	9 (a)	9 (b)	9 (c)	10 (a)	10 (b)	10 (c)	11 (a)	11 (b)	11 (c)	12	13	14	15
	UNITS NOS.	UNITS NOS.	UNITS NOS.	NOS.	NOS.	NOS.	NOS.	NOS.	UNITS NOS.	NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.	UNITS NOS.
1																							
2																							
3																							
4																							
5																							
6																							
7																							
TOTAL-FIRST 7 DAYS																							
8																							
31																							
TOTAL FOR MONTH																							
TOTAL COST				XXX	XXX	XXX	XXX	XXX		XXX													
AVERAGE COST PER UNIT				XXX	XXX	XXX	XXX	XXX		XXX													
ACCOUNT TOTALS																							

Actual Average Rate____

(A) Indicates Chatt or Gravel, (B) Slag or Rock, (C) Sand, Cinders or Earth.

One Page of the Condensing Sheet on Which the Data from the Foreman's Daily Reports Are Entered

costs and the total labor required on each item of work for monthly and yearly periods. The savings that may be effected by doing the various items of maintenance work during the season of their lowest unit cost on the various divisions is brought out by the data, and a basis for more definite planning and programming work is available.

The labor cost of renewing ties has been reduced, and is still being reduced. The numerous odd jobs that the section forces are called on to do are reported under "Miscellaneous other Maintenance Labor." This item aggregates a large sum of money for a period of a year and reduces the amount of labor applied in actual track maintenance. Effort to reduce this item has so far been partially successful.

Get at the Facts

The labor cost on the first item of work listed in the reports, "grassing track and cutting sod line," totals a very considerable amount during a year. The application of chemical weed killer reduces the labor on this item, and improves the appearance of the roadbed. The basis for ascertaining the actual saving by

SECTION AND EXTRA GANG LABOR—NUMBER OF UNITS, HOURS AND COSTS BY CLASSES OF WORK

Division____ Month of____ 19____

Item No.	DESCRIPTION OF WORK	UNITS, HOURS AND COSTS	CURRENT MONTH	LAST MONTH	SAME MONTH LAST YEAR	TOTAL THIS YEAR TO DATE
	Average Rate Per Hour	XXXX				
1	Grassing Track and Cutting Sod Line	Track Feet				
		Hours				
		Total Cost				
		Average Cost				
2	Mowing and Burning Right of Way	Track Feet				
		Hours				
		Total Cost				
		Average Cost				
3	Dressing Ballast Shoulder	Track Feet				
		Hours				
		Total Cost				
		Average Cost				
8	Unloading Ballast	Cars				
		Hours				
		Total Cost				
		Average Cost				
		Cu. Yds.				

A Portion of the Form for the Monthly Division Report

such practice is the reduction in total labor cost on this item for the year on the division on which the chemical weed killer is applied.

The division and system summaries show whether or not the policies or general instructions of the management as to pushing or deferring certain items of maintenance work are being carried out. At the end of the year the total cost of labor on the various items of work for the year are known, for each of the various divisions, as well as the entire system. After accumulating data of this kind for a period of years, it is obvious that it can be used as a reasonably definite and convenient basis for estimating labor allowances.

Records are kept for the system that show the total labor that has been expended on each of the items of work up to the end of each month. By comparison with the previous year, the progress of maintenance labor on any particular item of work can be readily ascertained.

SECTION AND EXTRA GANG LABOR — NUMBER OF UNITS AND AVERAGE COST PER UNIT BY CLASSES OF WORK — Office of Chief Engineer.

Division____ SYSTEM (EXCLUSIVE OF TEX. LINES) of APRIL 19 25

Item No.	DESCRIPTION OF WORK	UNITS AND UNIT COSTS	CURRENT MONTH	Man Hours	Percent of Total Hrs.	
	Average Rate per Hour		$ 0.4569			
1	Grassing Track and Cutting Sod Line	TRACK FEET	2,337,710	18,842	2.89%	
		COST	0.004			
2	Mowing and Burning Right of Way	TRACK FEET	222,620	1,655e	0.18	
		COST	0.005			
3	Dressing Ballast Shoulder	TRACK FEET	916,589	28,888	3.22	
		COST	0.012			
4	Unloading Ballast	CARS	1,460	3,930	0.78	
		COST	1.765			
5	Applying Chatt or Gravel Ballast	CU. YDS.	4,093	2,343	0.30	
		COST	0.173			
"	Applying Slag or Rock Ballast	CU. YDS.	894	347	0.04	0.80%
		COST	0.199			
"	Applying Sand, Cinders or Earth	CU. YDS.	3,328	1,248	0.16	
		COST	0.173			
6	Inserting Ties in Chatt or Gravel Ballast	EACH	37,855	29,141	3.86	
		COST	0.334			
"	Inserting Ties in Slag or Rock Ballast	EACH	14,799	11,417	1.44	5.48% 47.53%
		COST	0.334			
"	Inserting Ties in Sand, Cinders or Earth	EACH	48,405	28,971	3.66	
		COST	0.297			
7	Inserting Switch Ties	LINEAL FEET	46,953	7,259	0.92	
		COST	0.048			
8	Lining and Surfacing Track in Chatt or Gravel Ballast	TRACK FEET	361,548	21,803	2.99	
		COST	0.060			
"	Lining and Surfacing Track in Slag or Rock Ballast	TRACK FEET	108,188	12,479	1.57	9.79%
		COST	0.082			
"	Lining and Surfacing Track in Sand, Cinders or Earth	TRACK FEET	316,893	33,564	4.23	
		COST	0.062			
9	Laying Rail	TRACK FEET	100,809	11,585	1.46	
		COST	0.080			
10	Spotting Track	RAIL LENGTH	111,115	142,287	17.95	
		COST	0.881			
11	Applying Tie Plates	EACH	14,413	1,361	0.17	
		COST	0.041			
12	Tightening Bolts	JOINTS	138,345	12,347	1.56	
		COST	0.043			
13	Cleaning Ditches	HOURS		20,525	2.59	
14	Patrolling Track	"		36,122	4.45	
15	General Yard Cleaning	"		22,521	2.84	
16	Bridges Trestles and Track Culverts	"		2,542	0.30	
17	Repairing Frogs and Switches	"		14,898	1.84	
18	Repairing Right of Way Fences	"		15,111	1.91	19.23%
19	Repairing Cattle Guards and Wing Fences	"		8,253	1.04	
20	Repairing Public and Private Crossings and Signs	"		17,443	2.20	
21	Care of Station Grounds and Buildings	"		15,140	1.91	
22	Caring for Signals and Interlockers	"		1,344	0.170	
23	Caring for Switch Lamps outside Switching Yards	"		14,782	1.87	22.47%
24	Caring for Switch Lamps inside Switching Yards	"		8,838	1.01	10.16%
25	Caring for Signal Lamps	"		4,414	0.55	
26	Watching Crossings	"		40,744	4.31	
	Miscellaneous Other Maintenance Labor Excl. Items 13 to 22 Incl.	HOURS		122,891	15.47	
	Raw Work	HOURS		40,834	5.15	
	Other Labor (Excl. Items 23-26 Inc)	"		19,452	2.44	
	Total Hours			791,409	100.00%	
	Total Cost			$360098.71		6-4-25

A Typical Monthly System Summary

[The manner in which this system is applied on a division and the use made of it locally will be described in a following issue.]

Rebuilding Bridge Viaducts Under Extreme Difficulties

Louisville & Nashville Renews Approaches of Ohio River Crossing at Cincinnati With Company Forces

By J. M. Salmon
Bridge Engineer, Louisville & Nashville, Louisville, Ky.

THE LOUISVILLE & Nashville recently completed the erection of new single track spans on the approaches to its bridge across the Ohio river at Cincinnati, Ohio, under conditions which were exceedingly difficult and complicated, as the available space for operations was restricted, each approach being located in a city with all the surrounding areas improved. Not only was the work done in close quarters but it was carried on under heavy railroad traffic moving over a single track bridge. There were some 50 train movements over the bridge during each eight-hour working period, necessitating that the track be cleared at intervals averaging about ten minutes each. The work was handled entirely by the railroad's own forces.

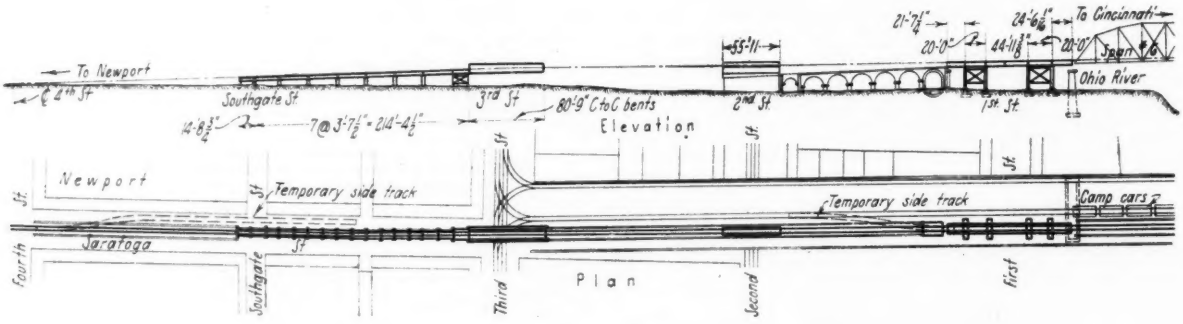


Fig. 1—Plan and Elevation of the Newport Approach

Work on the Newport Approach

The work on the Newport approach involved constructing masonry, dismantling old spans, erecting the new spans and raising the grade. Certain fixed horizontal and vertical clearances were to be maintained for the new structure and for the space occupied during erection.

The original approach consisted of 10 through girder spans and 3 deck girder spans resting on steel columns. These were replaced by 16 spans, using 1 through girder span and 15 deck girder spans, and substituting concrete piers for the steel columns. During the construction of the masonry numerous sewers, water lines and gas lines were encountered, notwithstanding efforts made to locate such obstructions before starting the plans.

A locomotive crane working from the main track was used for all of the work on this approach. A side track was constructed at the foot of the incline and another one near the upper end of the work, as shown by Fig. 1. These facilities enabled the locomotive crane to clear the main line quickly. Camp cars were placed on the electric railway track of span 6 of the river bridge, the use of which had been abandoned by electric cars, and they remained at this location through the entire period of reconstruction of both approaches to the bridge.

After constructing as much of the masonry as could be built, the old structure was raised to the revised grade line and the remainder of the masonry completed. The erection work started at the low end of the structure, the old spans being removed and the new spans put in place between trains. The old and new through girder spans over Third street had to be handled without interference with city traffic. Temporary bents were placed in the street at each end of the span on both sides of the track and the new girder span was erected at one side of the bridge on these bents. When the new span was ready the old span was slid out on the bents on the opposite side of the bridge as the new span was jacked sideways into place. This part of the work was handled on a Sunday night between the hours of 12 midnight and 2 a. m., when it was arranged to suspend all city traffic, including electric cars. The entire change was made in about two hours.

The Cincinnati Approach Is More Crowded

The Cincinnati approach was rebuilt substantially like the old structure, except that deck girders were used instead of deck trusses. Twenty-seven spans were renewed, and the upper part of most of the masonry was rebuilt with concrete. The greater portion of this approach is located on a 10-deg. curve and the space was even more cramped than on the Newport approach. The work here was purposely scheduled to be carried out after the Newport approach had been completed so that the field forces would be more proficient in the work. There was just sufficient room for the structure and requisite clearances for trains to operate. Numerous buildings, storage supplies, etc., were located under the structure with surface tracks as close to the structure as they could be placed. All kinds of telegraph, telephone and electric light

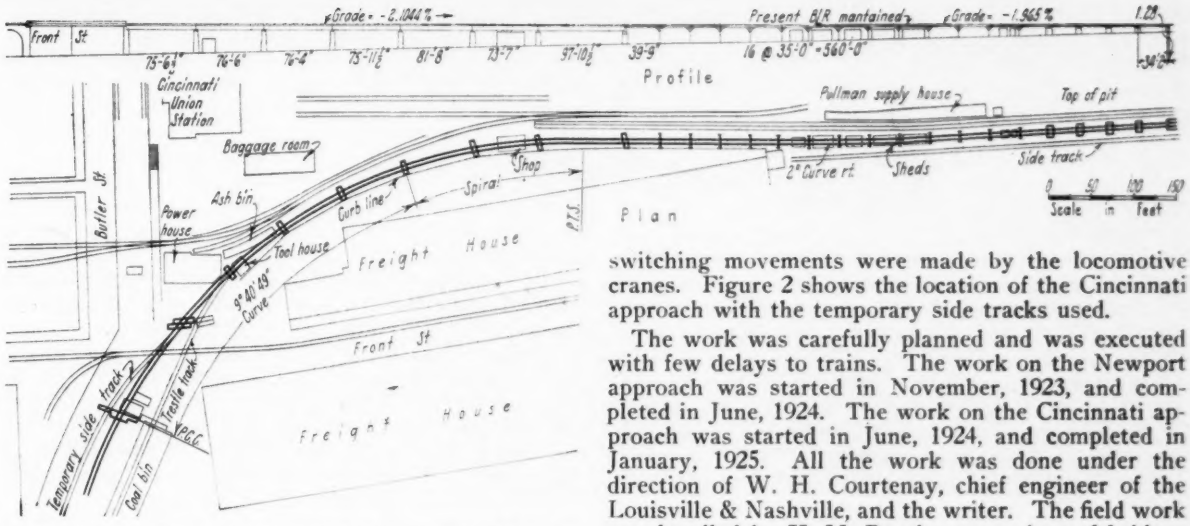
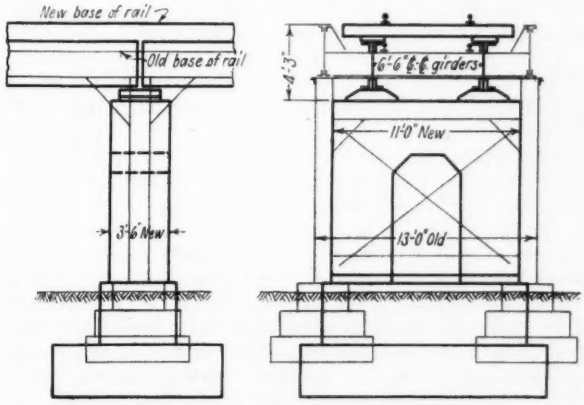


Fig. 2—The Cincinnati Approach Passes Through an Intensely Developed Passenger and Freight Terminal Area

wires, guy lines, high power lines, steam lines and water lines were also interwoven in and around the spans.

The old structure was first placed on falsework to permit the masonry to be altered. The materials for this part of the work were brought in by auto truck. The removal of the old steel work and the erection of the new spans were started at the low end of the approach. The old steel spans were burned apart with an oxy-acetylene torch. The first 12 spans of old work were removed and the new work was installed with the aid of a locomotive crane, operating from a



Relation of the Old Structure to the New

ground track immediately south of the structure. The surface traffic and the movement of trains across the bridge were so congested that only two 35-ft. spans were placed per week, taking six weeks to place these first 12 spans.

After these spans had been erected, two locomotive cranes working from the deck of the approach were used to erect all of the other spans. Side track facilities were available at the lower end of the viaduct, but it was necessary to construct an elevated side track at the upper end of the viaduct to clear trains. The material yard was located on the river front reasonably close to the work. The steel work was unloaded, stored and rehandled while erecting. Practically all switching movements were made by the locomotive cranes. Figure 2 shows the location of the Cincinnati approach with the temporary side tracks used.

The work was carefully planned and was executed with few delays to trains. The work on the Newport approach was started in November, 1923, and completed in June, 1924. The work on the Cincinnati approach was started in June, 1924, and completed in January, 1925. All the work was done under the direction of W. H. Courtenay, chief engineer of the Louisville & Nashville, and the writer. The field work was handled by H. M. Brooks, supervisor of bridges and buildings on the Cincinnati division.

The Renewal of Joints Increases Life of Rail

By C. A. Morse

Chief Engineer, Chicago, Rock Island & Pacific, Chicago.

ABOUT 1910, or about two years before the new union station was placed in operation at Kansas City, Mo., and in connection with the rearrangement of the Kansas City Terminal Railroad, it was arranged that a two mile track belonging to the Atchison, Topeka & Santa Fe and running from the junction of the Santa Fe with the Kansas City Terminal down to the old union depot was to be transferred to the Kansas City Terminal Railroad when the new union depot was put into operation. The rail on this track was old and beginning to ride very badly. As all the Santa Fe passenger trains passed over this track in entering the union depot it was necessary that something should be done to it.

The general superintendent of the Santa Fe, who was an ex-roadmaster, came to me with the suggestion that instead of laying new rail on this track, which was to be turned over to the terminal within a year or two and would then be used only as a freight track, we apply some new joints and see if we could not improve the riding of the track enough to carry it through until we turned it over.

Our standard joint at that time was a Weber joint and as it was expensive we decided to substitute plain angle bars for the old joints on this track. While we were expecting a decided improvement in the riding of the track, we were much surprised to find after we had applied the new angle bars that we had a first class riding track. The result of this experience was that we substituted new joints and found we were able to increase the life of the rail very materially in many places where we had apparently reached the point of needing new rail.

Applied on the Rock Island

In 1913, when I came to the Chicago, Rock Island & Pacific, we had a section of track about forty miles in length over which high speed passenger trains were operating. On my first trip over it I made a

note to the effect that this rail should be relaid as soon as possible. We were not able to get the rail with which to relay it and so we drove up the expansion, and put on new joints with heat treated bolts. I went over this track within the past two weeks, 12 years after the time when I had felt that this rail should be renewed, and in talking with the roadmaster we decided that there was no need of changing this rail out for at least another five or six years.

During the period of federal control, while I was handling maintenance for the Railroad Administration, and when it was impossible to get the amount of new rail that was needed on the railroads of the country, the suggestion was sent out, on my recommendation, that, due to the fact that we could not get new rail, new joints should be put on rail that it was thought needed renewing, with the idea of enabling us to carry this rail over to a time when new rail could be secured. This was done on many railroads, and the practice has gradually spread up to the present time.

Effects Marked Economies

We have put new angle bars on several hundred miles of track on the Rock Island with excellent results. In 1924 our assistant engineer in charge of track inspection inspected a number of miles of rail laid on our Illinois division in 1914, 1915, and on up to and including 1919, with the idea of finding at what age the rail began to show signs of dipping at the joints. He found a gradual reduction in the dipped ends of rails at joints until on the 1919 rail, or rail which had been laid five years, he only found about 16 rails to the mile that showed any sign of dipped ends. We put new joints on rails laid in 1919 that were beginning to show a slight inclination to dip. As a result of this inspection and our past experience in the replacement of joints, it was my feeling that with the amount of traffic we had on our Illinois division, which amounted to about 20,000 gross tons of freight and 11 passenger trains each way per day, if the old joints were replaced with new joints every five years, or at the end of five years after the rail was laid, at least five years additional main line life could be secured from the rail, as the cause of changing out rail on this territory, outside of curve wear, was entirely due to the dipping of the ends.

It looks further as though, if this policy is carried out, there is no reason why rail should not be continued in use on main lines until the top of the ball has worn to such an extent that the flange of the wheel engages the top of the joint. Of course, on heavier traffic lines rail will have to be changed out sooner, and if the traffic is heavy enough to wear the top of the rail down within four or five years, there is no object in changing out the joints. On the majority of the western railroads, however, a very decided lengthening of the life of main line rail can be effected by changing the joints periodically, and on lines with lighter traffic than on our Illinois division the period before they will require changing will be much longer, possibly extending to ten years.

Reclaiming Old Joint Bars

In connection with this subject an interesting development during the past year is the perfection of an arrangement by which worn joints can be heated, upset and pressed out to the full section and then heat treated. The process includes the insertion of pins in the bolt holes at the proper spacing so that the bolt holes are also brought back to their original size. It is thought that this re-forming of angle bars can be done for about one-third the price of new angle bars. If this proves to be the case, it means that angle bars taken out of service in connection with the relaying of rail, or in changing the joints, can be re-formed and used again. It should mean the practical elimination of the necessity for the purchase of new angle bars for repair work, or for the replacement of angle bars, as suggested. We have placed an order for ten thousand pairs of these re-formed angle bars this year to give them a trial, and if they prove a success, which we believe they will, we plan to have all angle bars on rail of 80-lb. and heavier sections re-formed by this process in the future.

In these days of intensive studies of economy in track maintenance, it looks as though the replacement of joints to increase the main line life of rail and the possibility of being able to have the joints re-formed, thus saving the purchase of new joints for replacement, is of sufficient importance to warrant investigation by the railroads of the country.

Railroad Relines Half Mile of Track at Cost of $15

EARLY THIS year the Louisville & Nashville had occasion to reline 2,400 ft. of main track from 1 to 5 ft. across a newly constructed fill near Berea, Ky., which operation was completed in 1 hour and 25 min. at a cost of $15. The necessity for this work arose from the construction of a second track and a change in grade. The track was laid a sufficient distance off center across a fill to permit a passing track and the old main track to be taken up and the old embankment raised to the new grade. After this work was done and the new main track and the siding rebuilt it was necessary to reline the other main track to its permanent location.

This track had been in service about two months when relined. The relining was done with an American ditcher from which the dipper had been removed, the cable detached from the bottom of the dipper and a hook placed on the end of it. The boom was then raised and the cable operated directly from the drum with the ditcher standing at right angles to the track to be lined. With this arrangement it was a simple matter to pull the track over so closely to its permanent line that little work was required with lining bars. The ditcher went over the track twice to re-line it in order to avoid bending the rail. The first time the hook was attached near the joint and the track pulled over as far as possible without injuring the rail. On the second pull, the track was brought to approximately its final location. This work was entirely completed in 1 hr. and 25 min. and in addition to the work train and ditcher, required two men to hook the cables to the rail. The total cost was estimated at $15, in comparison with which it was estimated that it would have cost not less than $100 to have lined the track with men. This work was handled by J. C. Nickerson, roadmaster, at Paris, Ky.

COST OF COAL LESS IN 1924.—The average cost of coal for road locomotives in freight and passenger train service (charged to operating expenses) in May was $2.73 a ton, as compared with $3.07 for May, 1924, and $2.80 for the first five months of 1925, according to the monthly statement compiled by the Interstate Commerce Commission.

Treated ties rendering excellent service under particularly adverse conditions in eastern Texas.

How The Railways Have Reduced Their Tie Requirements*

A Review of the Manner in Which Wood Preservation Has Extended the Life of Timber

By R. S. Belcher

Manager Treating Plants, Atchison, Topeka & Santa Fe, Topeka, Kan.

TREATED TIES were first used in the United States in 1838 when kyanized chestnut ties were laid on the Northern Central railroad in Maryland, now a part of the Pennsylvania System. Their value was demonstrated 11 years later when the ties were examined and found to be sound, while untreated ties had become useless. This incident is of interest not only by reason of its being the first treatment of wood in the United States of which there is a record, but also because of the fact that the first treatment was tie treatment.

In 1848 a kyanizing plant was built at Lowell, Mass., for the treatment of timbers used in the locks and canals on the Merrimac river. In 1856 the Vermont Central erected a burnettizing plant for the treatment of both ties and bridge timbers, but it was abandoned after having been in operation four years. The Chicago, Rock Island & Pacific, the Boston & Albany and the Erie built zinc chloride timber treating plants at about this time.

Early Ventures Not Successful

In 1863 the Philadelphia, Washington & Baltimore, and in 1867 the Philadelphia & Reading, built burnettizing plants, but all these plants are reported to have had but short life, due principally to the abundant supply of timber at the time and the unsatisfactory results obtained. Also people could not accustom themselves to the delay which the treatment of timber entailed and the work was done hurriedly without allowing sufficient time to do the work properly.

In 1865 a plant was built by the Old Colony railroad at Somerset, Mass., for the treatment of bridge timbers with creosote. This seems to be the first practical attempt recorded to use creosote for the treatment of timber in the United States. The treatment at this plant, it is recorded, was done with a rush and not as thoroughly as it should have been and much of the timber was trimmed after it had been treated, but in spite of this the work done by this plant was considered successful.

The First Modern Type Plant

Between 1865 and 1875 a number of patented treatments were tried out in the United States but were generally unsuccessful. In 1875 a creosoting plant was erected by the Louisville & Nashville at West Pascagoula, Miss. Probably this plant may be considered as being the first of the treating plants in the United States using a modern treating process. It met with marked success.

Another successful plant was that built by Eppinger & Russell in Long Island, N. Y., in 1878. In 1879 the New Orleans & North Eastern built a treating plant primarily to treat the timbers used in the bridge across Lake Ponchartrain, which bridge, nearly six miles long, was built in 1883, and it is still in excellent condition after over 40 years of service.

The Wyckoff Pipe & Creosoting Company erected a treating plant in 1881 at Portsmouth, Va., the Colman Company one at Seattle, Wash., in 1884, the Santa Fe at Las Vegas, N. M., in 1885, and the Chicago Tie Preserving Company one in 1886. From this time the development of ties and timber treatment in the United States has been rapid and at the present time there are

*Abstracted from a paper presented at a joint meeting of the Executive committee of the American Wood Preservers' Association and the Committee on Wood Preservation of the American Railway Engineering Association at Montreal on July 8.

114 pressure process treating plants and 42 non-pressure process treating plants in operation while over sixty million ties are treated annually.

What of the Results?

While the beginning of tie treatment in the United States is of interest, we are more concerned with the results obtained and in speaking of these results we should first mention the conservation of our forests. What has tie treatment done to conserve our forests?

A well treated tie will last on the average at least three times as long as an untreated tie. Using this as a basis, it may be said that each of the sixty million ties now being treated annually in the United States has saved two ties to our forests, or the equivalent in timber to be used for other purposes. The number of ties which may be obtained from the average acre of forest land is variously estimated from 60 to 125. Even if we use the larger figure, we find that the annual treatment of sixty million ties means the saving of 1500 square miles of forest, or if put in terms of timber growth, the annual growth of 94,000 square miles of forest.

Specific examples of the benefits of tie treatment are given by the Wood Preservation committee of the American Railway Engineering Association in its report to the association last March in the form of a statement of cross tie renewals per mile on 21 railroads. Eliminating two of these, one of which does not show miles of track and another which began the use of treated ties only a few years ago, a weighted average of renewals per mile of the 19 remaining roads shows a decrease of 63 ties per mile in 1923 as compared with 1914. The total track miles and the weighted average renewals per mile for the 19 roads for each of the 10 years follow:

Date	Total Track Miles of 19 Railroads	Weighted Average Tie Renewals per Mile for 19 Railroads
1914	154,022	249
1915	155,611	261
1916	158,267	244
1917	159,103	200
1918	161,049	189
1919	162,012	196
1920	162,524	201
1921	162,784	203
1922	164,211	193
1923	165,434	186

These roads began the extensive use of treated ties at different dates between 1900 and 1911. The average date is about 1907.

While much has been done in the past, still greater results may be accomplished in the future. While we are treating sixty million ties annually, this is only half the number of ties produced each year in the United States. I subscribe to the thought contained in the 1924 report of the Committee on Wood Preservation of the American Railway Engineering Association: "The use of treated ties of one kind or another is not only an economic necessity but an economic duty for all railways. Nothing but treated ties should be laid, irrespective of climate or any other conditions. The only exception to be taken is in the case of such railways as still have available naturally long life woods, such as redwood, tidewater cypress, cedar, or other woods of equally known long natural life."

Other Points to be Considered

We have passed that time in the history of the treatment when we shall talk only about preventing fungi from causing decay of ties and although this is the most important feature of tie preservation, there are other important features which add to tie life.

Although of great importance, the tie plate only needs mention; its benefits are recognized. It would be difficult to say too much in favor of boring and adzing ties prior to treatment at the plants. Even if we were not going to treat the ties I believe this would be a good investment, by reason of the fact that boring of the spike holes minimizes the breaking down of the wood structure and therefore enables the tie to hold the spike more firmly and for a longer period than if unbored. The necessity of having true bearing surfaces in the same plan for tie plates is obvious.

In the southern part of the United States, at least, it has been found that the trimming of the ties by the cut-off saws of these machines is of great advantage because even the most experienced inspectors cannot always determine the condition of the timber after the ends of the tie become weathered. In some cases an appreciable number of unsound ties have been detected, and thus the loss saved, which would have resulted if they had been treated and placed in track. Where this boring and adzing is done prior to treatment it has an added value inasmuch as it saves adzing of the treated timber and allows the preservative to penetrate the wood around the spike hole, the point at which decay is most likely to start. In short, the cost of boring and adzing is small and in my opinion brings greater proportionate returns than any other money spent on ties.

Increased Importance of Petroleum

It has been demonstrated that petroleum adds to the life of ties by retarding or preventing checking or splitting of the wood. There are now seven railroads in the United States using creosote-petroleum mixtures as tie preservatives, the mixture varying from 70 per cent creosote and 30 per cent petroleum to 30 per cent creosote and 70 per cent petroleum.

It appears that we can add to the excellent results already obtained by treatment not only by treating more of the ties produced than we are now doing, but also by more extensive boring and adzing of ties at the treating plants prior to treatment and the addition to our preservatives of materials such as petroleum or tar which will add to the life of our ties.

A 30-in. Creosoted Wood Pipe Culvert Installed in 1898

The Pile Driver at Work on the Trestle. The East Portal of the Tunnel Is in the Shadow at the Left of the View.

Well-Organized Work Clears Damage Done by Earthquake

Shoo-Fly 1,800 Ft. Long, Built to Restore Traffic Around Tunnel Blocked By Great Rock Slide

LATE IN JUNE the newspapers gave brief statements of the damage done by earthquakes in Montana and while they reported that the Transcontinental line of the Chicago, Milwaukee & St. Paul was closed to traffic on account of obstructing rock slides, nothing appeared that would afford a clear idea of the damage done nor of the unusual problems presented in restoring the line to traffic. The following, based primarily on an article in the Milwaukee Magazine for August, describes the remarkable situation created by the earthquakes and outlines the means taken to overcome it.

The first tremblor occurred at 6:15 p. m. on June 27, others following in rapid succession for some hours and then occurring at greater intervals over a period of practically 36 hours. A graphic description of the earthquake was given in a letter written by F. D. Campbell, assistant master car builder of the Chicago, Milwaukee & St. Paul at Tacoma, who was a passenger on the first section of train No. 15 (the Olympian) from which the following is abstracted.

"We had reached a point three-quarters of a mile west of Barron, (Mont.) when we experienced what we considered a sun kink under the train, and we ran 10 car lengths before the train was brought to a stop. Looking backward nothing could be seen but dust, black clouds and rocks coming down on the railroad track and bounding into the Missouri river. We did not even then realize it was an earthquake. We got out and walked back to inspect the train and the track, and when we started toward the head end again, the second shock came which informed us very unmistakably, by the upheaving of the ground and terrifying roar, that it was an earthquake.

"The train was well loaded and we took extra precaution in the care of the passengers. There were in the tourist car a detail of regular army men who rendered wonderful assistance; for soon after the second and severest shock our crew managed to find a hand car and, with the assistance of the officers and soldiers, we were able to pull it around the train, over the rocks so that we could get to Eustis and into communication with the outside world. There were no rocks on the track in our immediate vicinity, but many lying alongside and large cracks in the earth; but near Eustis we found rocks in the cut and wires and communication cut off. East of Eustis there were huge rocks, from 1 to 15 tons in weight on the track, and rails were bent like hairpins. It was late Saturday night before we were able to get into feeble communication, through Lombard, to Deer Lodge to give them information of our whereabouts and condition."

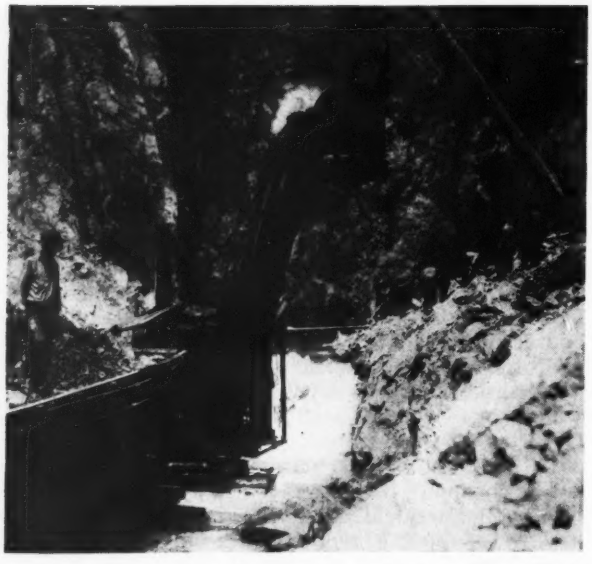
The portion of the line traversed by this train at the time of the accident, a short distance west of Lombard, was subject to repeated rock falls from the bluff during the course of the disturbance, which tied up traffic, as described by Mr. Campbell. However, the real blockade occurred further east in the Sixteen Mile canyon where a rock fall from a high cliff effectively closed the portal of tunnel No. 8. It is a singular fact that the second section of train No. 15 had cleared this tunnel just nine minutes when the first tremblor occurred and at the time of the first quake was traversing a territory where the disturbance caused no damage.

The shutting off of the power caused the train to be stopped, but it was able to coast down hill into Lombard, a few miles further west, where the train was tied up until the line was opened to permit it to continue its course to the coast.

The situation wrought at tunnel No. 8 was a peculiar

Driving Piles for the Trestle.

one. The tunnel, only 160 ft. long, cuts through a lofty shoulder formed by a sharp curve in the canyon which, at this point, has very steep walls on both sides. The earthquake caused a large part of the top of this shoulder to slide in a westerly direction on an inclined cleavage plane filling up the approach cut, completely blocking it. But the most serious result was that the great



The shovel at work in the cut. A part of the guy derrick is seen at the right.

rock slide blocked the canyon with a great pile of loose rock and debris damming the stream and in a short time formed a lake approximately 200 ft. wide, averaging 30 ft. deep and extending a mile eastward.

The first positive word of the havoc at tunnel No. 8 was received from H. M. Geelhart, roadmaster on the Musselshell division, with headquarters at Roundup, Mont., who had arrived from the east with his wrecker and crew. He crawled over the top of the slide and got into Lombard where he relayed the news to a point further west where forces were being mobilized to attack the problem of clearing the line from the west side.

Although none of the tunnel had been destroyed, a study of the conditions at the west portal showed that it would require 40,000 cu. yd. of excavation to clear an approach to the tunnel. It was therefore decided that the line could be opened more quickly by building a shoo-fly following the course of the canyon and after a preliminary survey it was found that this would entail the construction of 1,800 ft. of line with a 16-deg. curve around the nose of the shoulder through which tunnel No. 8 had been driven.

On the east end this had to be constructed largely on a pile trestle built to a grade to keep the track above the waters of the newly formed lake and to meet

View at the west side of the slide taken just after the shovel had arrived and was being made ready to work on the cut.

the lowest elevation it was practicable to reach in cutting through the pile of debris that blocked the canyon west of the shoulder. The construction of this shoo-fly proceeded at once with equipment and material delivered from the east. At the west end the situation presented more formidable difficulties. To excavate a cut through the pile of rock was a task in itself, but it was made more difficult by the fact that the cut thus formed would have to serve both as the roadbed and as a waterway for the creek. It was thought that a large charge of explosive judiciously placed would be effective in moving a part of the material out of the way and also break up the rock for more easily handling of the remaining excavation. Accordingly 60 boxes of dynamite (3,600 lb.) was discharged in one shot that served to loosen the top of the dam and assist in opening up a waterway.

Following this, an Osgood-Marion "whirly" type shovel on caterpillar treads and equipped with a 1¼-yd. dipper commenced excavating the cut at the west end. To enable the cut to serve both a waterway and

a railway it was taken out 3 ft. 4 in. below the base of rail on the established grade, thus affording clearance for the ties, stringers and caps of a frame trestle constructed as the shovel proceeded. Dump cars backed onto this trestle received the material from the shovel.

The work of the shovel was supplemented by a 15-ton steam, guy derrick set up on the rock pile and by a 150-ton Bucyrus wrecker, which were employed in removing the large rock or in widening the cut. A large force of men was also employed in excavating by hand.

Just before the gap in the shoo-fly was closed. The two pile drivers are seen approaching each other. Note the rapid flow in the channel formed by the steam shovel.

In handling the construction of the trestle the work was expedited by floating the material for the bents and deck alongside the driver where it was carefully arranged for convenient handling with the pile line. One interesting feature of this work was the employment of a diver to explore the bottom in advance of the driving to determine whether any large rocks blocked the way on the location of the bents. He was also in constant attendance to place sway bracing on the bents below water level, for although the piles had from 6 to 30 ft. of penetration they stood in 30 ft. of water for a large part of the length of the trestle and required more bracing than could be had in the limited distance that the bents projected above the water.

The construction of the frame trestle behind the shovel imposed serious difficulty because the strong current flowing through the shovel cut made it necessary to resort to various expedients to hold down the caps and stringers until the trestle could be weighted down with the deck and track. As soon as the cut was completed a driver working from the west end drove pile bents under the trestle to insure greater degree of stability for the trestle in the swift current and on July 10 the driver, working from the west, met the driver from the east, completing the shoo-fly. Traffic was restored at 9 p. m. on that day.

The marshalling of the resources of the railroad to meet the crisis was under the direction of B. B. Greer, chief operating officer, who was on the Pacific coast at the time, and he and the general officers of the lines west proceeded to the tunnel as quickly as possible after the news of the earthquake reached them. In the meantime the organization of the Rocky Mountain division, under J. P. Phelan, superintendent, had undertaken the clearing of the line west of Lombard where rock falls had blocked and torn up the track, and forces from the Musselshell division had been organized for work from the east. The engineering and construction work on the shoo-fly was under the immediate direction of W. H. Penfield, system engineer maintenance of way, and R. J. Middleton, assistant chief engineer of the lines west.

Some Practical Suggestions For Outside Concrete Stairs

By M. E. KENT
Mason Foreman, New York, New Haven & Hartford, Westerly, R. I.

OUTSIDE CONCRETE steps are generally built with the tread sloping down about one-half inch per riser. When such steps are finished smooth, as is often the case, or when wet or covered with ice, they become dangerous or treacherous to use, especially for anyone who is descending them. On several sets of concrete steps which have been built by the writer, I have reversed this slope of the tread so that the rear of the step is about one-half inch lower than the front edge or nosing. This arrangement has proved to be very satisfactory even when covered with ice and has provided a sure footing for anyone going up or down. When steps are constructed in this manner between solid walls it is, of course, necessary to provide some means for drainage. This can be done by sloping the two extreme edges of the tread toward the nosing, the riser being made slightly lower at the two upper corners, thus providing for two small drains.

In order to secure a good tread, concrete steps should be topped off with a mixture of one to two coarse sand and cement and simply finished with a wood float, the corners being rounded with an ordinary edger. When the treads are built and finished in this manner, they will not wear smooth or become slippery. However, if the steps are subjected to heavy and continuous use, the concrete will naturally wear out in time. Under such conditions, the steps should be constructed so that pre-cast treads can be utilized. The pre-cast treads should be about two inches thick and should be laid in weak cement. They can thus be easily renewed when necessary.

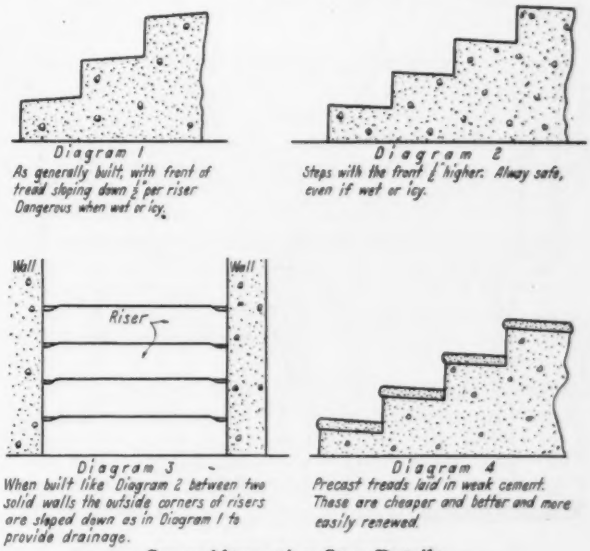


Diagram 1
As generally built with front of tread sloping down ½" per riser. Dangerous when wet or icy.
Diagram 2
Steps with the front ½" higher. Always safe, even if wet or icy.
Wall
Wall
Riser
Diagram 3
When built like Diagram 2 between two solid walls the outside corners of risers are sloped down as in Diagram 1 to provide drainage.
Diagram 4
Precast treads laid in weak cement. These are cheaper and better and more easily renewed.

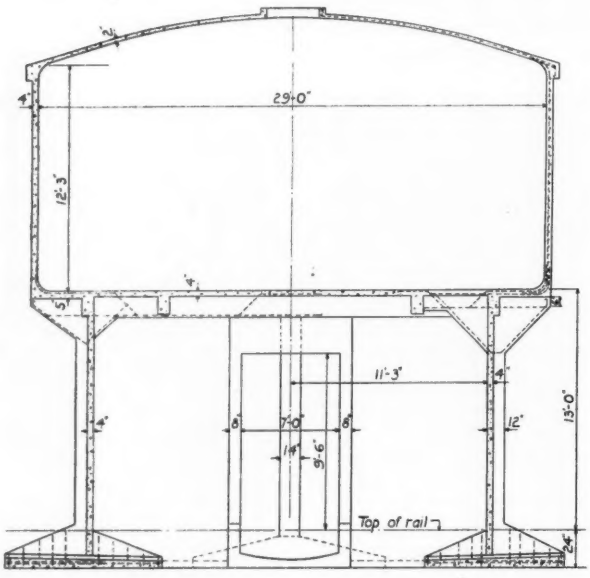
Some Alternative Step Details

Concrete Tanks Like New After Twenty Years' Use

ON THE ATLANTA & West Point and the Western Railway of Alabama are two concrete water tanks, both built in 1905, which are believed to be the first concrete tanks used in railway water service, having now been in continuous operation for 20 years. One is at Hogansville, Ga., and the other at Notasulga, Ala.

The most interesting feature of these tanks is a lightness of the design which would be noteworthy today and must have been even more so 20 years ago. In the preparation of the plans it was held that thin walls and small diameter bars closely spaced would produce the most satisfactory results. Any criticism of the design must face the fact that the tanks have proved satisfactory in every respect. There has been no leakage whatever and the small amounts charged to maintenance have been expended on the spout, fixtures, doors and windows, and not on the tank proper.

The tanks are cylindrical; the interior diameter being 29 ft., the height 12 ft., and the capacity 60,000 gal. The bottom of the tank is 13 ft. above top of rail, the tank being carried on 13, 8-in. by 12-in. concrete columns arranged in the form of a hexagon inscribed within a circle having a radius of 11 ft. 9 in. These columns carry a girder and beam system that supports the floor proper which itself is but 4 in. and 5 in. thick. The side walls are 4 in. thick, reinforced with 3/8, 1/2 and 9/16 in. plain round bars at spacings varying from 4 to 8 in. The roof is dome-shaped with a rise of 30 in. and is only 2 in. thick. It is reinforced with 3/16, 1/4

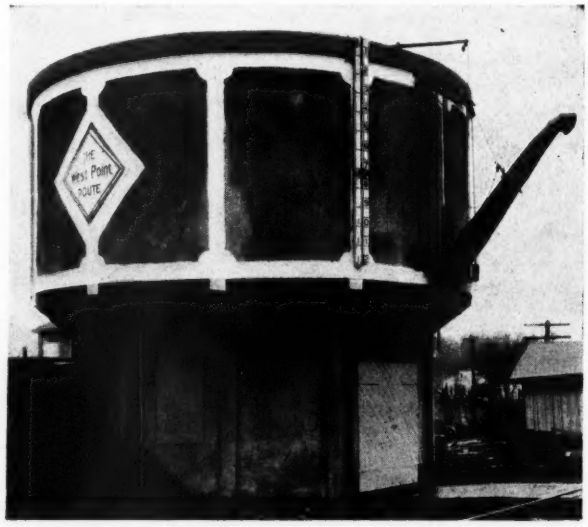


General Structural Features of the Two Tanks

and 5/16 in. bars arranged in a system of hoops and spokes with a maximum spacing of about 12 in. in each direction. A large "hoop" at the eave, reinforced with one 1-1/4 in. round bar, takes care of the thrust of the roof. An opening three feet in diameter in the center of the roof provides access for cleaning and inspection.

The footings are equally light. A wall four inches thick is cast between the columns to form an enclosure which is used as a tool room, in one case by the signal department and the other by the water service department.

Pit-run mixed gravel and sand were used in the construction, the proportions varying with the amount of sand in the mixture but being somewhat better than a 1:2:4 mix. While the foundations were being placed, tests were made to secure a mixture of the greatest practical density, that is, a watertight concrete. A fairly wet, but not sloppy, mixture was used, the consistency being such that it would completely cover the



The Tank at Hogansville, Ga.

bars and flow against the form. Three 1/4 in. coats of 1:1 mortar were applied to the interior of the walls and floor while they were still quite green, in order to secure as monolithic a construction as was practical. No waterproofing of any type was used and none has been needed.

The tanks lend themselves readily to ornamentation as can be seen from the illustration. The railroad monogram was placed in diamond shaped panels on each side where it can be seen from the rear of trains.

Have Given Longer Life Than Wooden Tanks

There have been water stations at Hogansville and Notasulga for 70 or 75 years during which time wooden tanks have been renewed two or three times. If new wooden tanks had been built in 1905 a further renewal would now be necessary. As it is, the concrete tanks have been entirely satisfactory and from present appearances they will last indefinitely. During the 20 years these tanks have been in service, they have been subjected to temperatures ranging from zero to 100 deg. F. At the time of construction the tanks cost $2,295 and $2,810 respectively, the higher cost being for the one at Notasulga where a quck-sand foundation made special footings necessary. It may be noted for the one at Notasulga where a quick-sand foundacypress tanks were costing about $1,600 each at that time.

The tanks were designed by F. Berne, chief engineer for the contractor, The Southern States Ferro Concrete Company. The work was constructed under the direction of H. W. Seib, roadway engineer, now consulting engineer for those railroads, to whom we are indebted for plans, photographs and the above information.

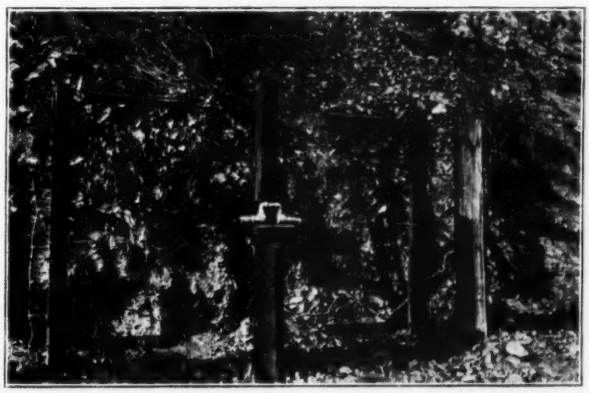
Signal Fences Detect Rock Slides on Northern Pacific

By C. A. CHRISTOFFERSON
Signal Engineer, Northern Pacific, St. Paul, Minn.

AUTOMATIC block signals, because of their closed circuit control features, lend themselves readily to providing additional safety protection, aside from that which is commonly considered as their function. In 1921 one of our supervisors of bridges and buildings, J. Flemming, conceived the idea of putting a heavy mesh wire fence along the right-of-way on rock slopes, where we occasionally had slides and where it was necessary to maintain a watchman, and to connect these fences up with our automatic block signals. In March, 1923, we installed the first fence on a branch line near St. Regis, Mont. This consisted of two sections, each 150 ft. long. After installing this fence we were able to dispense with one watchman.

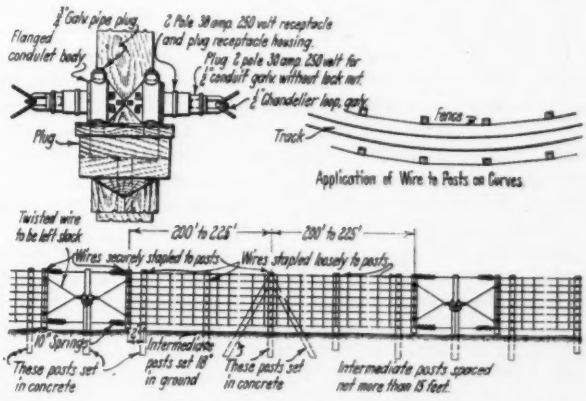
As shown in the sketch, the one end of a 200-ft. section of fencing is stapled solid to the end post and stapled loosely to the intermediate posts, while the end near the plug is stapled securely to a loose stick. The coil springs, top and bottom, which are attached between this stick and the center post, take up the slack in the fence, yet allow movement of the wire mesh when large stones roll against it. Any movement of the fence caused by a large stone rolling against it pulls the wires through the loose staples and jerks the loose stick, thus stretching the springs and jerking the plug out of the connector. The opening of this contact through which the track circuit is connected, at once sets the automatic signal at the danger indication.

Our records show that this first installation at St. Regis has operated seven times for small slides, stopping ten trains and three times for large slides, stopping two trains. The second installation was near Bradley, Mont., in October, 1923, which has detected two small slides with five train stops and one large one with one train stop. In November, 1924, a third installation was made on the Idaho division near Weeksville, Mont., consisting of two sections of fence with three connections to circuit, with a total length of 2,286 ft. Our records show we have had one small slide with 12 train stops. One watchman was dispensed with at a saving of $77.60 per month for ten months of the year.



The Plug Cut-out Connectors in the Fence

The fourth installation was made in November, 1924, in the Yakima Canyon on the Pasco division. Ten sections of fence were installed with 17 connections to circuits, with a total length of 5,393 ft. Three watchmen were dispensed with at a saving of $264 per month. Records show that we have had 34 small slides with 99 train stops and 15 large slides with 40 train stops on this section. Through experience we have been able to modify the installations so that the fences are not operated so often by small slides that would not cause the derailment of trains; thus greatly reducing the number of train stops.


Flanged conduit body
Plug
Track
Fence
Application of Wire to Posts on Curves
Twisted wire to be left slack
200' to 225'
200' to 225'
Wires securely stapled to posts
Wires stapled loosely to posts
10" Springs
These posts set in concrete
Intermediate posts set 18" in ground
These posts set in concrete
Intermediate posts spaced not more than 15 feet.

Details of the Fence Construction

Welding Rails Together Keeps Joints Out of Crossings*

By P. J. MC ANDREWS
Roadmaster, Chicago & North Western, Sterling, Ill.

TO AVOID the presence of rail joints in a long skew highway crossing on the Chicago & North Western continuous rails 198 ft. long were provided by welding together three 66-ft. 100-lb. rails. The crossing occurs at the intersection of Fourth street and Lincoln highway at DeKalb, Ill., and is a long one. Lincoln highway, in addition to being a transcontinental auto route, serves at the point also as the main street of a city of about ten thousand inhabitants. This made it essential to avoid frequent work on the track in the crossing and it was decided to weld enough rails to eliminate joints entirely.

The welding was done by the regular track welders employed on this sub-division in building up frogs and rail ends, and was supervised by representatives of the Oxweld Railroad Service Company and the roadmaster of the subdivision.

The rails were set up on blocking outside of tracks and as near to the crossings as conditions permitted, care being taken to have the blocking level, and the rails in line so that the rails would not be welded into a crooked position. The angle bars were bolted in place at the welds to insure safety in case of a failure of either of the welds, but it is confidently believed by all concerned that the welded joint is stronger than any other part of the rail. A "supporting truss" was welded on at the joint to give added strength to the weld.

When the welding was completed, and the change

*From the Maintenance of Way Bulletin for June, 1925.

was to be made, the 198-ft. rails were pulled on the crossing by a work engine and placed at approximately the proper position outside of the track; the planks were removed from alongside the old rails, the spikes pulled and six 33-foot rails in one string were pulled off the crossing by the work engine, the welded rails then being put in place, ties renewed where necessary and the track carefully surfaced.

The cost of welding these joints was about $12 each, this figure covering all material and labor in connection with the handling of rails, and the actual welding. With greater experience the welders have been able to do the work more efficiently with the result that the total cost of other welds has been about $9 instead of $12 as in this case.

It is believed that for crossings of such width that joints may be kept out of them by the use of 66-foot rails, rails of that length should be furnished, but where necessary to weld rails to eliminate joints, the practice is safe and economical, and the expense for welding is offset several times by the reduction in the cost of maintaining the joints in the crossing.

Railroad Reservoir in Kansas Provides Large Ice Harvest

THE LARGEST quantity of natural ice ever harvested in western Kansas was cut from the new Missouri Pacific water service reservoir five miles south of Hoisington, Kans., between January 1 and 14, this ice representing a valuable by-product of the water service development. This reservoir, which was completed less than two years ago, has a storage capacity of 200,000,000 gal., and was described in detail in an article appearing in *Railway Engineering and Maintenance* for August, 1923, page 317.

When full it has a surface area of 48 acres, a fact which led L. W. Baldwin, president of the railroad, to issue instructions on December 16 to harvest 5,000 tons of ice for railway use from this body of water. As ice in central and western Kansas rarely attains a thickness of more than eight or nine inches and as there were few instances on record of any one having gathered more than 100 tons of ice from any ponds, lakes or streams in that territory, this plan met with considerable misgiving on the part of those who were instructed to carry it out. However, a series of storms and a protracted period of unusually cold weather throughout the latter part of December resulted in the formation of an unusually thick covering of ice and by the time that plans for gathering the ice were completed on January 1 the ice had attained a thickness of 13 in. and was increasing in thickness daily. The following account of the manner in which the ice was gathered is based on an article by L. V. Hyatt, assistant supply agent, Missouri Pacific, which appeared in the Missouri Pacific magazine for April, 1925.

Work Had to Be Done Quickly

The problem of gathering the ice was a serious one. Although the weather had been cold and had produced plenty of ice, it was known from experience that a southwest wind might come up at any time which would cut an open field of ice to pieces in a very few hours. It was necessary, therefore, to harvest the ice in the shortest possible time. A further difficulty was the lack of mechanical conveyors or modern power-driven ice-working tools. But an even greater obstacle was the lack of men who had had any experience in ice harvesting, since work of this kind was practically unknown in that country.

The first step was to secure Fresnos with which to clear the snow from the ice over a sufficient area to permit work on the ice to proceed. Having cleared a sufficient field, an ice plow was used to mark it into cakes 22 in. wide by 40 in. long. Next the ice was cut to form a channel of open water leading to an incline and trestle which had been constructed to elevate the ice for loading into cars.

The regular procedure was to cut the ice into sections 4 cakes wide by 20 cakes long, each section making about 2,400 lb. of ice. These were floated or rafted from the ice field to the foot of the incline, where a large force of men was kept busy spudding them into standard cakes and guiding them to the chute, where they were elevated to the top of the incline by cables pulled by both teams and trucks and slid by gravity to the loading docks and cars.

Owing to the absence of any side tracks at the reservoir it was necessary to load all of the ice on the main line of the Great Bend branch of the Missouri Pacific, a condition which required the service of a work train all the time that ice was being loaded. Any operation in connection with the harvesting of ice is very hard work, from the sawing in the field until the cake is finally set up in the car, and it must be kept moving and few men were able to stand the work from the start of the harvest until its completion. Trouble was constantly experienced because of the shortage of men.

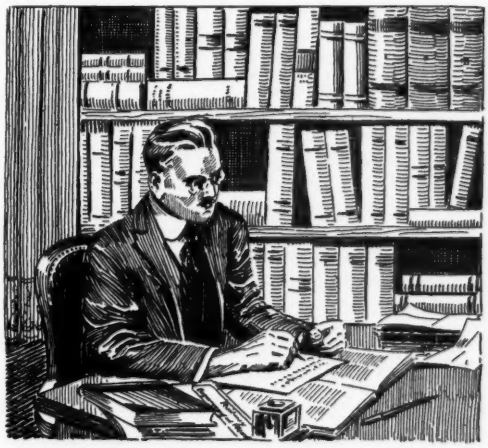
Although 40,000 cakes of ice were handled, none of the 60 to 70 men employed on the work was seriously injured. There were many narrow escapes. Sometimes 1,000 lb. of ice going up the chute would break loose and come crashing back down the incline, and only by the utmost caution were serious accidents averted. "Duckings" in the deep ice-cold water of the reservoir happened daily but these experiences served to increase the caution of the men in their work.

Keeping the Channel Open

Because of the continuous cold weather the water in the open channel would almost invariably freeze during the night and cause trouble in the starting of the work in the morning. To prevent this, men were employed to row a boat up and down the channel during the night to keep the water open, but almost invariably a sheet of ice from ½ to 1½ in. thick would be formed by the time that the gang was ready to go to work, making it necessary to put all hands to flailing the ice with long poles until the necessary open channels were formed. Sometimes a large block of ice was cut loose at the far side of the field and after getting two or three men to ride on it, ropes were tied around their shoulders to serve as tow lines for hauling the raft of ice through the channel, breaking up the fresh-formed coat of thin ice.

The work was completed on January 14, at which time 4,975 tons of ice had been loaded, of which 3,900 tons were stored in the Hoisington ice-house, the balance being placed in houses at Pueblo, Colo., and Osawatomie, Kan. Calculations of cost show that the entire cost for labor of harvesting, work train service and unloading at the ice house at Hoisington demonstrated a net saving of $8,691 in the cost of ice stored at that point, as compared with the cheapest price at which artificial or natural ice could be purchased elsewhere. This figure takes no account of the shrinkage

What's the Answer?



This department is designed to serve as a reader's service bureau, wherein the many problems which arise in the routine maintenance of tracks, bridges, buildings and water service facilities, may be subjected to frank and thorough discussion. The value of the service thus rendered is proportionate to the extent to which readers avail themselves of it, in submitting questions and in lending their co-operation by offering answers to the questions presented.

Questions to Be Answered in November

1. *How frequently should a roadmaster go over his various sections with the foremen on foot or motor car?*
2. *To what extent is the standardization of pumping units practical and desirable?*
3. *To what extent is it desirable and practicable to work all members of section gangs part time during the winter in lieu of laying part of the men off?*
4. *What provision should be made for the prevention and fighting of fire in coaling stations?*
5. *Is it better to bend the inside splice bars at the heel of a switch to provide for free movement of the switch rails, or to plane off the bars to accomplish this object?*
6. *In a case where a masonry structure has been destroyed by a flood and submired stone or concrete interferes with the driving of piles for the temporary trestle required to restore traffic, what is the most practical method of blasting out the masonry so that the pile driving can proceed?*
7. *Under what conditions should (a) tamping bars, (b) tamping picks, and (c) track shovels be used for tamping ties?*
8. *In building a small passenger station of high grade construction is the use of creosoted timber for the sills and joists supporting the floor where no basement is provided justified to insure a long life for the floor construction?*

Rate of Flow in Settling Tanks

What is the maximum rate at which treated water should rise in a settling tank to insure the removal of all matter precipitated by the chemicals?

Best Results are Secured at Five Feet Per Hour

By J. H. Davidson

Water Engineer, Missouri-Kansas-Texas, Parsons, Kans.

The maximum rate at which treated water should rise in a settling tank to insure the removal of all matter precipitated by the chemicals is largely dependent upon the character of the precipitate formed and this depends on the temperature of the water, the thoroughness with which the chemicals and water have been mixed, and the character of the incrusting matter which is to be removed.

The precipitate obtained by the lime and soda ash cold-process softener, where no downtake agitation is provided but the water and chemicals are thoroughly mixed at the point of contact, will settle in the tank at the rate of from seven to ten feet per hour. In order to insure the proper removal of these particles sufficient margin should be allowed between this rate and the rate of upflow. Excellent results have been obtained in such plants with the reaction time of not less than five hours and a rate of upflow of four to five feet per hour. In some special cases this rate of upflow may be safely increased but for average conditions where filtration is not resorted to the rate of upflow should not exceed five feet per hour.

Eight Feet Per Hour Should Not Be Exceeded

By R. C. Bardwell

Superintendent Water Supply, Chesapeake & Ohio, Richmond, Va.

My experience in this connection has indicated that the maximum rate of vertical velocity of treated water in settling tanks should not exceed eight feet per hour for the ordinary soda ash and lime treatment. This, of course, applies to continuous water treating plants but I have checked this rate of sedimentation in many intermittent plants and have found the figures comparable. If the rate of eight feet per hour is exceeded, "milky" water will be carried over into the storage system unless filtration is provided. The use of sodium aluminate, or alum, will materially improve the rate of sedimentation but, as a general rule, I do not believe that the maximum rate of eight feet per hour should be exceeded.

Match Marking Released Rail

Is it worth while to match mark rail as it is released from track for relaying elsewhere?

It is Expensive

By L. H. Bond

Engineer Maintenance of Way, Illinois Central, Chicago

A great deal of consideration has been given the question of whether or not it pays to match mark rail. Our released rail is usually sent to a saw for the purpose of sawing off the ends and redrilling. This gives

an unworn fishing surface for angle bars and squares up the ends of the rail.

It requires loading and unloading at the saw locations, which tends to mix up the original shipments; and we often find three or four divisions shipping rail to one or the other of the saws at the same time. It is, therefore, almost impossible to keep together rail of the same wear.

I belive the cost of sorting and matching rail would be prohibitive but some process for grinding rail ends after laying in track would partially solve the problem of poor matching. Trials we have made of grinding indicate satisfactory match can be made in this way.

(A review of current practices on a number of railroads which resaw rails most extensively indicates that rather than attempt to match mark rail the rail is carefully calipered and classified so as to segregate rails of different amounts of head wear. Careful adherence to this procedure insures that rails relaid in any one stretch of track have very near the same height of head and thus give good joints. According to W. A. Roderick, roadmaster, Wheeling & Lake Erie, Dillonsvale, Ohio, smoother riding track is obtained if the rails are matched marked before being taken up and relaid in the same order as they had previously been in track.—Editor.)

Pipe Railing Construction

What are the relative merits of riveted and screwed connections for pipe railings?

Many Considerations Are Involved

By Office Engineer

Pipe railings such as are used on bridges or for other outdoor purposes are made of standard wrought pipe joined by malleable iron fittings provided by manufacturers for this particular purpose. These fittings are similar to ordinary pipe fittings but differ from ordinary fittings in that the crosses and tees have one outlet provided with left hand threads. These are necessary for inserting the horizontal pipes of a railing between the posts. In other words, because these pipes must be entered into the post at each end simultaneously the threads on one end must be left hand.

This requirement does not apply to the posts of the railing in which the threads are all right hand. Moreover, the posts can be constructed in a shop so that all cutting and threading of the pipe for the posts may be done with the economy of shop conditions. Consequently, posts are almost invariably made with threaded connections. On the other hand, a number of railroads have found it of considerable advantage to use riveted connections in the horizontal members of the railing. This not only eliminates the cutting of the pipe to exact lengths and threading right hand on one end and left hand on the other but it enables the user of the pipe to avail himself of the advantages of purchasing pipe in random lengths, that is, pipe in lengths ranging from about 11 to 20 ft. threaded at both ends with a coupling at one end. Pipe in random lengths may be purchased cheaper than pipes cut and threaded to a specified length. Manufacturers of railing fittings will furnish them reamed for riveted connections on order.

The elimination of the threaded connections in the horizontal pipes introduces no difficulties in erecting the railing. The random lengths of pipe are screwed together by means of the couplings and are passed through the tees and crosses in the posts, which have been reamed out for this purpose. This permits the posts to be placed independent of the joints in the railing, except as is necessary to miss the couplings. The exact length of the pipe to finish the railing at the ends is obtained by cutting off the pipe with a hack saw, no pipe cutter or threader being necessary on the job. The horizontal pipes are attached to the post by passing small rivets through holes drilled through the pipe and the fittings, a soft iron rivet being used for this purpose which can be upset cold.

Another advantage of the riveted connections for the horizontal rails of pipe railings is that it affords convenient means of providing expansion joints in long railings, the longitudinals being cut where they pass through the posts, the pipes entering on one side being riveted while those entering on the opposite side are left free to slide.

Draining Water from Borrow Pits

To what extent should the track forces endeavor to drain away water standing in borrow pits or other depressions on the right-of-way beyond the toe of the embankment?

It Depends on Local Conditions

By Bernard Blum

Engineer of Maintenance of Way, Northern Pacific, St. Paul, Minn.

The question as to how far track forces are warranted in going to drain away water in borrow pits depends almost entirely on the character of material in the embankment, the distance from the track grade down to the surface of the water and the nearness of the standing water to the actual toe of embankment. Where the natural character of the country is a heavy coarse gravel and embankments are seven feet or more in height, it would not appear necessary to spend very much money on such drainage. The heaving of track in the winter time is influenced by the amount and distance the water stands below the ties and where water in borrow pits is directly the cause of heaving, every effort should be made to improve the drainage conditions.

With some soils, the structure of the material is such that heavy capillary attraction moistens the embankment for a considerable distance above the ground water level. Where such conditions prevail we are justified in spending money to drain away water even in excess of the saving to be made in track maintenance as such wet conditions of the sub-grade present more or less of a hazard to traffic.

Should be Done if Possible

By K. H. Hanger

Engineer Maintenance of Way, Missouri-Kansas-Texas, Dallas, Tex.

A considerable and consistent effort to drain borrow pits or other depressions on the right-of-way beyond the toe of embankment or beyond the berm should be made. The extent to which this should be gone into might well be expressed by the term, "All the traffic will bear"; that is, dependent on available funds, effort should be made to rid the right-of-way of water in these depressions, so that ultimately all pits will be drained. Proper regard for this feature at the time of

construction will leave little heritage to the maintenance forces to correct.

A few of the numerous reasons justifying the effort to drain these places are greater stability to embankment and roadbed, less likelihood of slides, the avoidance, particularly in the south, of mosquitoes, less vegetation to contend with, lessened interference with work on telegraph and other pole lines and on fences.

There is no definite measure of the extent that track forces should undertake this work. It is a problem peculiar to each road. The desired practice should be eventually to complete the work of draining all such places.

Wire Glass in Railroad Buildings

What are the advantages of wire glass and where should it be used?

Of Value Primarily for Fire Protection

By Hugo W. Hesselbach
Architect, Southern, Washington, D. C.

We recommend the invariable use of wire glass for skylights, for monitor sashes where they deviate from the vertical line, for windows in fire-proof buildings, for elevator enclosures and, in short, wherever fire-proof partitions or enclosures having glass are desirable.

It was thought at one time that a considerable saving might be effected by using wire glass throughout the windows in shop buildings, but as the breakage even in wire glass was found to be very heavy, the economy of its use for that purpose is doubted, so that we have reverted to the use of plain glass in our largest recent shop structures.

(Note: The advantage of wire glass as a measure of fire prevention is well known and has led to the requirement included in the building ordinances of most cities that wire glass shall be used in the windows facing on courts, windows opening on to fire escapes, etc. The property of wire glass which makes it of value as a fire stop, namely that the glass will be held in place by the wire even after it is broken, has also proved of advantage in skylights since in such use the breaking of the glass does not result in the pieces falling out with the hazard of injury to persons occupying the space below. Mr. Hesselbach's statement outlines the usual practice of the railways with respect to this material and also calls attention to certain of its limitations.—Editor.)

Oiling Switch Points to Reduce Wear

Is there any merit in the application of oil to the faces of switch points to reduce wear?

Not Economical on Steam Railways

(By Engineer, Maintenance of Way)

The oiling of the rails on sharp curves and the oiling of switch points is a matter of common practice on electric railways. But the oiling of curves on steam railways can be carried out in a more practical way by installing locomotive flange oilers in districts where the curvature is heavy. The oiling of switch points on steam railways as a means of reducing wear seems entirely impracticable as the wheels of a long train would wear off practically all of the oil and it would require almost constant attendance to keep the rail coated.

The problem of reducing the wear on switch points can be more satisfactorily solved in other ways. On main track switches in which the turnout receives only a normal amount of use, the main line point is the one which needs protection and if proper care is used in making the bend in the stock rail the switch point should not be subject to excessive wear. The most serious problem encountered in main line switches is in the switch point on the outside of a curve. Here the most practical protection is the use of a guard rail placed as close as possible to the switch point in the inside rail. Some railways follow the practice of staggering the switch points to make the guard rail more effective. In the case of switches in which the turnout is frequently used, particularly in yards, the most effective protection of the point is afforded by a switch point protector.

(W. A. Roderick, roadmaster, Wheeling & Lake Erie, Dillonsvale, Ohio, advises that he has found that the oiling of switch point faces reduced the wear appreciably and that he requires the faces of switch points to be oiled every two weeks.)

Trucking Material from Hand Ditching

How far is a section gang warranted in trucking dirt excavated in ditching in order to use it in widening banks?

Hand Ditching Should Be Avoided

By Chief Engineer

In these days when effective mechanical equipment such as the ditcher or the ditcher-spreader can be used for ditching operations on the railroad, at a cost far less than it can be done by hand under the most favorable conditions, it is very extravagant to employ section gangs at hand ditching. In my opinion section gangs should clean out ditches with shovels and truck away the dirt only in occasions of emergency such as isolated slides in cuts where the amount of ditching to be done is so small that it would be uneconomical to move a ditching machine to the point where the work was to be done. In such cases as these the material will have to be trucked as far as is necessary to dispose of it. In short, hand ditching is so expensive that a discussion of the economical length of haul has little practical value.

Hand Ditching Costs Too Much

By C. L. Elliott
Roadmaster, Ft. Worth & Rio Grande City, Brownwood, Tex.

There is but one way and only one method used in ditching of today which is both practicable and economical and this is to use machines and work trains. In the old days of railroading a section gang of 10 or 15 men could keep up a 5 to 7 mile section and do the trucking from cuts to widen embankments by using push cars and dump boxes. But times and conditions have changed to such an extent that we do not have time to use this slow method of widening fills, due to the fact that the business on all railroads has increased greatly, power is heavier, more tonnage handled, passenger traffic much heavier, and this increases our responsibilities in keeping our tracks in proper shape and in safe running condition.

The expense of the upkeep of our railroads to-day is more than double what it was 20 and 25 years ago, our forces have been reduced, our work extended over

more territory, and the old methods of track work and ditching as well as bank widening have had to be changed to meet the requirements demanded of us by our managements.

Not Over Six Hundred Feet

By T. B. Cobb
Roadmaster, St. Louis-San Francisco, Ft. Worth, Tex.

The cost of trucking dirt for bank widening should be divided between the cut and the fill as a betterment is obtained from both the ditching and the bank widening. My experience in this class of work shows that only 10 per cent of time can be used in going to and from the loading and dumping places, as 30 per cent of the time will be used in dumping and spreading and 60 per cent in shaping ditches and loading dirt. An average of 600 ft. is as far as dirt can be trucked and make it pay.

Required Slope on Waterproof Decks of Ballasted Bridges

What is the minimum allowable slope on a ballasted bridge deck to insure the effectiveness of a high-grade membrane waterproofing?

Adequate Drainage is Essential

By F. A. Locke
Waterproofing Engineer, The Lehon Company, Chicago

Waterproofing is an accessory to the proper design of the structure on which it is placed and unless the design meets the requisites for effective waterproofing it is difficult, if not impossible, to make the structure thoroughly waterproof even though the best materials and most careful workmanship are applied in constructing the membrane covering.

The first requisite for good design in a structure to be waterproofed is effective drainage. The primary object is to get the water off of the structure as rapidly as possible. In all cases, the slope of the bridge deck and particularly that of gutters and valleys should be made as steep as physical conditions will permit, and based on experience I am of the opinion that a grade of one per cent is the absolute minimum, for unless the grade is at least one per cent normal, variations in workmanship in constructing the deck or in applying the waterproofing membrane will produce pockets that will not drain. Water retained in such pockets, particularly in freezing weather, are sure to cause damage which will eventually result in leakage.

A One Per Cent Grade is Required

By G. A. Haggander
Bridge Engineer, Chicago, Burlington & Quincy, Chicago

My views on this matter are the same as those published on page 503 of Volume 21 of the American Railway Engineering Association (report of the Committee on Iron and Steel Structures). This states that: "One per cent is a minimum desirable grade, but the grade away from points which are difficult to waterproof should be correspondingly increased. While sewer and gutter grades may be made considerably less than one per cent, bridge floors, especially if ballasted, are subject to clogging by ashes, cinders, etc., and hence require steeper slopes to secure satisfactory drainage."

Cleaning Out Inverted Siphons

How should an inverted siphon culvert be constructed to facilitate the removal of sediment or other debris?

A Further Answer to a Question Covered in Last Month's Issue

By William Wilson
Superintendent, Southern Pacific, Stockton, Cal.

The Modesto Irrigation district, which distributes irrigation water in the San Joaquin valley, has quite a number of siphon culverts under our railroad and experiences no difficulty when a full head of water is passed through them. The greatest trouble with sediment occurs when a full head is turned on after a period during which the flow is under only a half head. This often causes the siphon to be blocked with sediment.

It is the general recommendation of the irrigation engineers that all siphons be of sufficient size to enable them to be cleaned out readily. As a matter of fact, irrigation water from the Sierra Nevada mountain water shed is clear and carries very little silt or debris. Consequently, the troubles are reduced to the minimum.

Operating Air Lifts in Winter

Is the air lift pumping system subject to impairment by winter weather? What precautions may be taken to prevent it?

A Further Answer to an Old Question

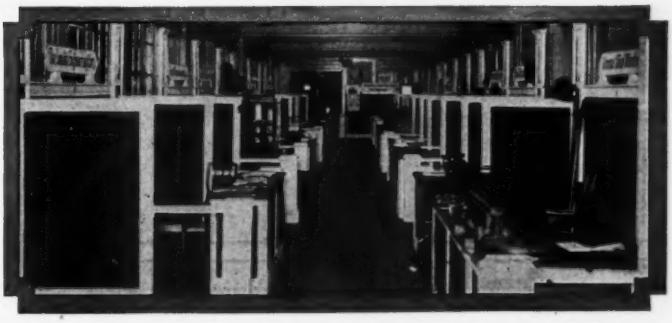
By J. M. Anderson
General Water Service Foreman, Los Angeles & Salt Lake, Salt Lake City, Utah

We have in operation on the Salt Lake division four air lift systems which have been in successful operation for 16 years and I am convinced that the air lift is a most effective and efficient means of delivering water at terminals where a compressed air supply is maintained for other uses and also in some cases where the air must be provided for this purpose alone.

We have three wells which are operated with a submergence of 310 ft. with winter temperatures as low as 28 deg. below zero. In the case of these wells the delivery pipe is carried to a tank 52 ft. above the surface, but there is no chance of freezing when water is not being pumped because the static level of the water is 10 ft. below the surface. It is essential, however, to be sure that the air is free from moisture to prevent the air line freezing.

At another terminal where the consumption is 300,000 gal. of water per 24 hours, we have installed air lifts in artesian wells which flow 600 gal. of water per minute at the surface but will not deliver the water to a tank 50 ft. high. In these wells the water in the delivery pipe stands 36 ft. above the surface when not in operation. Consequently it is necessary to provide protection against freezing. To provide for this condition the plant is equipped so that an automatic float in the tank is arranged so that when the tank is full cutoff valves in the delivery pipe and the air supply line are closed and a small relief valve in the supply line is open to drain it effectively to avoid freezing. This plant has been in constant operation for eight years with temperatures in some winters going to 30 deg. F. below zero and has never frozen up.

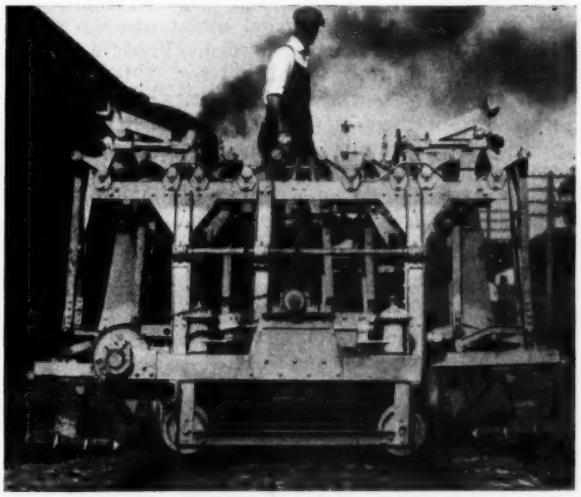
New and Improved Devices



Skeletonizing Track by Machine

THE MAINTENANCE Equipment Company, Chicago, has designed a machine for skeletonizing track which has shown good results in the service to which it has been subjected to date in cleaning out the ballast between the ties preparatory to surfacing the track on new ballast or to cleaning the ballast by the Power Ballast Cleaner. In operation the machine removed the ballast to the bottom of the tie for the entire length of the tie, throwing it each way from the center of the track at an average rate of about one crib per minute, the actual time ranging from 45 sec. to 1 min., 10 sec. per crib. The machine has cleaned 360 cribs in an eight-hour day, in which the actual time worked was approximately six hours. This was accomplished on double track on which the machine was given the exclusive use of the track for the greater part of the working day.

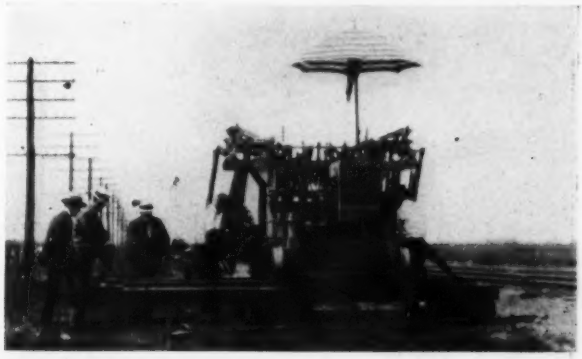
Three men are required to operate the machine; an operator, and two laborers who move the machine from crib to crib by means of pinch bars, clean the ballast off the rail and help set the machine off the track when necessary. The unit is self-propelling but it is found that time is saved by having the laborers pinch the car ahead as the distance for each move is only about 20 in.



Removing the Ballast from the Cribs

The mechanism consists of four manganese steel digging shoes, one outside of each rail and two between the rails, suspended from the superstructure and so arranged that they are lowered to the bottom of the tie as the digging progresses. At the beginning the two shoes outside the rails are lowered to the ballast and started, removing the ballast from between the ends of the ties to make room for that moved forward by the shoes between the rails, these shoes being put in operation immediately following the outside shoes. The path described by the shoes in operation is an ellipse, rising at the forward end of the stroke and lowering at the end of the backward travel to a digging position, the shoes on the outside of the rail passing back under the rail to remove the ballast cast forward by the shoes between the rails.

The machine is driven by a 16 hp. Le Roi four-cylinder, automobile-type gasoline engine operating at 1,000 r.p.m., and driving the digging shoes at the rate of 70 strokes per minute. The shaft of the engine extends lengthwise to the end of the car and power for the various operations is transmitted by means of sprocket wheels of suitable ratio. All operations are controlled from an elevated platform with all the levers easily accessible to the operator.



The Machine Set Off the Track to Clear Trains

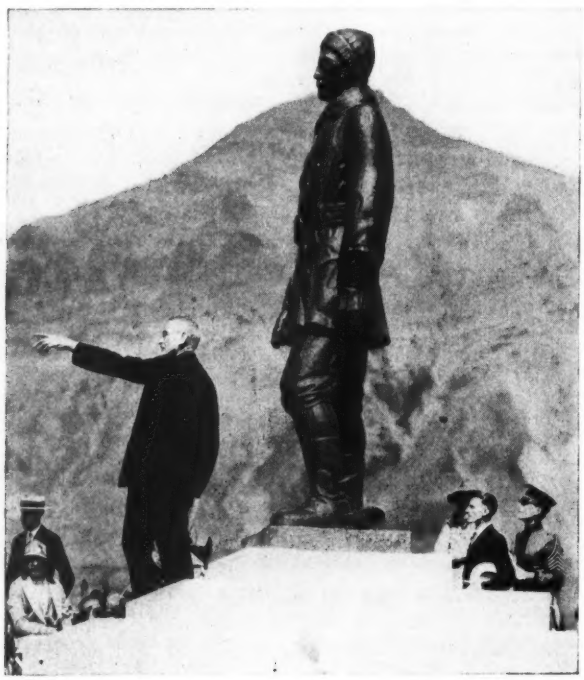
The car body has a length of 11 ft. 6 in. and an overall width of 10 ft. 4 in., allowing ample clearance when working on double track lines. The machine weighs 8,000 lb. and is provided with transverse wheels so that it may be set off the track where necessary. Four screw-jacks, one at each corner, operated by the motor, expedite the placing of take-off rails and lift the machine so that it will clear the main track running rails.

MINNESOTA ELIMINATES UNNECESSARY CROSSINGS.—A survey of the lines of the railways in Minnesota is now being conducted by Railroad Commissioner Frank W. Matson of that state, with the co-operation of the railways themselves, to determine what grade crossings may be vacated in order to reduce the hazard of grade crossing accidents. This action was made possible by a law recently passed by the legislature of Minnesota which empowered the Railroad and Warehouse Commission to order the elimination relocation of any crossing of a public highway and a railroad within the state.

Monument Erected in Honor of a Railway Engineer

ON DECEMBER 11, 1889, John F. Stevens, after untold hardships in the course of an exhaustive reconnoisance, attained the summit of Marias Pass in the Rocky Mountains and satisfied himself that this point was the best location for the Great Northern crossing of the Continental Divide. The discovery of this pass shortened the proposed line to the coast by over 100 miles and afforded far better alinement, much easier grades and much less rise and fall. He succeeded where others had failed.

That this service to the Great Northern was appreciated by the late James J. Hill, whose genius was responsible for the building of this transcontinental line, is attested by Mr. Stevens' rapid rise in the engineering department of that system to the position of chief engineer and in Mr. Hills' recommendation of him in 1905 to William Howard Taft, then secretary of war, for the position of chief engineer of the Panama Canal and chairman of the Isthmian Canal Commission.



Mr. Stevens Making His Response to the Dedicatory Address on the Unveiling of the Statue of Himself

In further recognition of this service and his subsequent achievements as an engineer a bronze statue of Mr. Stevens has been erected adjacent to the Great Northern tracks at the summit of the pass near the place where he spent a cold winter night in 1889 after his arduous work had been completed. The monument was dedicated with impressive ceremonies on July 21, which were unique in occasions of this character in that Mr. Stevens himself was present and responded to the dedicatory address made by Pierce Butler, associate justice of the United States Supreme Court. Prominent among those who were present on this occasion were Ralph Budd, president of the Great Northern; C. O. Jenks, vice-president in charge of operation, and W. P. Kenney, vice-president and director of traffic.

With the Associations

The American Railway Engineering Association

The proceedings of the last convention have come from the press and are now being distributed to the members.

Instructions for the Maintenance and Inspection of Superstructures of Steel Bridges, presented by the Committee on Iron and Steel Structures, and the Rules Governing First Aid to the Injured, prepared by the Committee on Rules and Organization, both of which were presented before the last annual convention, have been reprinted in the Journal of American and Chinese Engineers, Hong Kong, China.

The Roadmasters' Association

Arrangements have been made with the Atchison, Topeka & Santa Fe for the operation of a special train which will leave Chicago at nine o'clock on Monday morning, September 21, arriving in Kansas City late that evening. This will afford an opportunity for those members en route to the convention from points east of Chicago to observe track maintenance methods on a well maintained western road. Those expecting to travel on this train should advise T. F. Donahoe, secretary of the association, 428 Mansion street, Pittsburgh, Pa., of their intention in order that adequate provision may be made for their accommodation.

All reports of committees have been completed and they are now in the hands of the Publication Committee.

The Track Supply Association

A total of 55 companies have now arranged for exhibits in the Track Supply Association. Companies which have arranged for space in addition to those mentioned in the July and August issues include the following:

American Steel & Wire Company, Chicago.
Balkwill Manganese Crossing Company, Cleveland, Ohio.
Carbic Manufacturing Company, Duluth, Minn.
Chicago Malleable Castings Company, Chicago.
Chipman Chemical Engineering Company, New York City.
Mechanical Manufacturing Company, Chicago.
Reliance Manufacturing Company, Massillon, Ohio.
Skelton Shovel Company, Inc., St. Louis, Mo.
Union Switch & Signal Company, Swissvale, Pa.
Warren Tool & Forge Company, Warren, Ohio

In addition three firms have applied for membership without space.

Cleveland Frog & Crossing Company, Cleveland, Ohio.
Railway Purchases and Stores, Chicago.
William Wharton Jr. & Company, Easton, Pa.

Bridge and Building Association

The American Railway Bridge and Building Association will hold its thirty-fifth annual convention at

the Statler hotel, Buffalo, on October 20-22. The following is the program of that meeting:

Tuesday Morning

Convention called to order at 10 a. m.

Opening address by R. E. Woodruff, division superintendent, Erie, Buffalo, N. Y.

Address by R. H. Aishton, president, American Railway Association.

President's address—J. P. Wood, supervisor of bridges and buildings, Pere Marquette, Saginaw, Mich.

Report of secretary-treasurer.

Report of committee on the Use of Motor Cars by Bridge and Building Gangs.

Tuesday Afternoon

Report of committee on Precast Concrete Units Used in Bridge Construction and Maintenance.

Paper on the Treatment of Water for Locomotive Use by R. C. Bardwell, superintendent, water supply, Chesapeake & Ohio, Richmond, Va.

Report of committee on the Use of Electricity for the Operation of Water Stations.

Tuesday Evening

Address by George J. Ray, chief engineer, Delaware, Lackawanna & Western, on Impressions of European Maintenance Practices.

Wednesday Morning

Report of committee on the Use of Creosoted Timber, including the Selection of Woods Best Adapted to Treatment.

Address on the Erection of the Michigan Central Bridge at Niagara Falls by H. Ibsen, bridge engineer, Michigan Central, Detroit, Mich.

Report of committee on the Application of Protective Coatings to Structural Steel.

Wednesday Afternoon

Report of committee on the Relative merits of Steel and Wood Window Sash for Various Types of Railroad Buildings.

Address by Frank H. Alfred, president, Pere Marquette, Detroit, Mich.

Report of committee on Economic Methods of Handling Minor Jobs of Maintenance Work.

Wednesday Evening

Annual dinner of the American Railway Bridge and Building Association and the Bridge and Building Supply Men's Association.

Thursday Morning

Report of committee on the Reduction of Accidents to Employees. Closing Business.

The Bridge and Building Supply Men's Association will present an exhibit in rooms adjacent to the convention hall.

Directory of Associations

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, Buffalo, N. Y., October 20-22, 1925.

AMERICAN RAILWAY ENGINEERING ASSOCIATION (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, Congress Hotel, Chicago, March 9-11, 1926.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention January, 1926, Cleveland, Ohio.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—B. J. Wilson, Pocket List of Railroad Officials, 605 Fischer Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

NATIONAL ASSOCIATION OF RAILROAD TIE PRODUCERS.—J. S. Penney, secretary, T. J. Moss Tie Company, St. Louis, Mo. Next convention January, 1926, Cleveland, Ohio.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, secretary, Seeberger Building, 825 South Wabash avenue, Chicago. Annual exhibition at convention of American Railway Engineering Association.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention September 22-24, 1925, Kansas City, Mo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual Exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Material Market

THERE IS REASON to believe that the closing months of 1925 will be characterized by greater business activity. Weekly carloadings are again above the million mark, the building industry is in full swing and the volume of purchases has increased. The last-named condition is definitely manifest in the iron and steel market and, to some measure, in the lumber market. In the iron and steel industry it has been responsible for an increase in production after more than six months of almost continually decreasing operations.

The renewed activity in buying in the iron and steel industry has, as yet, not been of sufficient duration to result in any marked increase in unfilled orders. As a consequence it has not been reflected in prices which, as will be noticed in the table below, have not changed to any marked extent in the past month.

PRICES PER 100 LB.

	Pittsburgh	Chicago	Pittsburgh	Chicago
	July		August	
Track spikes	$2.80 to $3.10	$2.90 to $3.00	$2.80 to $3.00	$2.90 to $3.00
Track bolts	3.90 to 4.25	3.90 to 4.00	3.90 to 4.25	3.90 to 4.00
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.35 to 2.40	2.35	2.35 to 2.40	2.25 to 2.35
Boat spikes	3.25	3.25	3.25	3.25
Plain wire	2.50	2.55 to 2.60	2.50	2.55
Wire nails	2.65	2.70 to 2.75	2.65	2.70
Barb wire, galv	3.40	3.40 to 3.45	3.35	3.40
C. I. pipe, 6 in. to 12 in., ton		48.20		
Plates	1.90	2.10	1.80 to 1.90	2.10
Shapes	2.00	2.00 to 2.10	1.90 to 2.00	2.10
Bars, soft steel	2.00	2.10	1.90 to 2.00	2.10
Rivets, struct	2.40 to 2.50	2.60	2.40 to 2.50	2.50 to 2.60
Conc. bars, billet	2.00		1.90 to 2.00	
Conc. bars, rail		2.00		2.00
Rail, per gross ton, f.o.b. mills		43.00		43.00

The scrap market, which has always been more sensitive to business trends than the market for new materials, shows evidence of the fact that those who have scrap for sale are confident that the demand for this material is definitely on the increase. As shown in the table below prices for scrap have advanced appreciably.

PRICES PER GROSS TON AT CHICAGO

	July	August
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for re-rolling	17.50 to 18.00	19.00 to 19.50
Rails less than 3 ft. long	18.25 to 18.75	20.50 to 21.00
Frogs and switches cut apart	17.00 to 17.25	18.00 to 18.50
Steel angle bars	17.50 to 18.00	19.50 to 20.00

No marked changes in the volume of lumber sales have taken place during the past month and prices of lumber, as indicated in the tables below, have not been subjected to radical variations.

SOUTHERN PINE MILL PRICES

	July	August
Flooring, 1x4, B and B flat	$45.74	$45.50
Boards, 1x8, No. 1	36.90	34.85
Dimension, 2x4, 16, No. 1, common	27.04	27.25
Dimension, 2x10, 16, No. 1, common	28.25	28.41
Timbers, 4x4 to 8x8, No. 1	27.31	27.80
Timbers, 3x12 to 12x12, rough		28.61

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear flat	$27.00	$28.00
Boards, 1x8, 6 to 20, No. 1, common	16.50	16.50
Dimension, 2x4, 16, No. 1, common	17.50	17.50
Dimension, 2x10, 16, No. 1, common	17.00	17.00
Timbers, 6x6 to 8x8, No. 1, common	23.00	21.00
Timbers, 10x10 to 12x12, rough	18.00	18.00

As shown in the table below no changes have occurred in the prices of Portland cement from those appearing in the table in last month's issue. Following are prices per barrel in carload lots, not including package.

New York	$2.15	Minneapolis	$2.42
Pittsburgh	2 19	Dallas	2 05
New Orleans	2.40	Denver	2.84
Chicago	2.20	San Francisco	2 31
Cincinnati	2.47	Montreal	1.80

News of the Month

The total number of stockholders of Class I railways, not including switching and terminal companies or lessor companies, for the year ended December 31, 1924, is reported by the Interstate Commerce Commission as 799,958, as compared with 807,524 in 1923.

The number of persons who visited Glacier Park this season up to August 1 was 22,558, as compared with 16,282 in the same period of 1924. Of the total for the present season 9,837 were railroad tourists, while 12,721 traveled to the park by other means, primarily private automobiles.

On August 3 the Louisville & Nashville held a reception to its neighbors at the division terminal at Etowah, Tenn., at which time about 600 people visited the shops of the company on the invitation of the officers of the road. From 9 a. m. until 3 p. m. guides conducted parties of visitors through the shops every 30 min.

What is by far the largest project for automatic train control undertaken thus far is that covered by a contract recently awarded by the New York Central to the General Railway Signal Company. It covers the material for automatic train control on 871 miles of road in the New York Central system. Much of the district embraced is four-track, both freight and passenger tracks being included in the plans.

The New York Central has leased to "Eastern Offices, Incorporated," the rights above the railroad level, of the block between 43d and 44th streets, New York (east of the Grand Central Terminal and north of the Commodore Hotel) for the construction of what is to be "the world's largest office building"; 30 stories high and with 1,350,000 sq. ft. of rentable office space. The building will cost about $19,000,000, and will measure 21,000,000 cu. ft.

General managers of the Atchison, Topeka & Santa Fe, the Union Pacific and the Southern Pacific have expressed the willingness to shorten running time of passenger trains from Chicago to Los Angeles, Cal., if conditions permit, in a joint letter addressed to the Los Angeles Chamber of Commerce. The Los Angeles Chamber of Commerce is asking that half a day be cut from the running time of transcontinental trains. The railways are now investigating the practicability of this proposal.

Ninety employees of the Pennsylvania Railroad System were retired from active duty on August 1, under the company's pension plan, and placed upon the "Roll of Honor." Seven of those have been in the employ of the road for 50 years or more each, while 55 have had records of 40 years' service or more. Since the establishment of the Pennsylvania's pension plan, on January 1, 1900, a total of 18,374 employees have been retired under its provisions; of whom 8,262 are still living.

The largest volume of car loading for the present year occurred in the week ending August 8, when the total number of cars loaded on the railroads in the United States amounted to 1,051,611 cars. This was the fourth consecutive week in which the cars loaded aggregated in excess of one million. The accumulative total of cars loaded for the first 32 weeks of 1925 is 32,280,136, a figure which is well above the corresponding totals for 1924 and 1923, the figures for these two years being 28,597,081 cars in 1924 and 29,953,453 in 1923.

A formal protest has been entered by the Brotherhood of Locomotive Engineers with the Illinois Commerce Commission against the issuance of a permit for the operation of a competitive bus line over a state highway between Dixon, Ill., and Sterling. This is believed to be the first instance of a brotherhood officially taking such action. The protest is made on the grounds that the bus line would divert a certain amount of passenger business from the North Western and would tend to lessen the number of employees required to provide passenger service on the railway.

As the result of an increase in the appropriation for the work of the Division of Valuation of the Interstate Commerce Commission, arrangements have been made to increase the force employed on this work by the addition of 266 persons, raising the total to approximately 600. The additional force will include engineers, land appraisers and accountants. The Class I carriers reporting to the Presidents' Conference Committee have expended $80,380,350 for valuation work during the 11½ years ending December 31, 1924, with a few carriers not reporting, of which $6,602,197 was expended during the last year. For the fiscal year ending June 30, 1924, the Interstate Commerce Commission spent $1,245,718, making its total expenditure $25,597,543. Estimating that $510,000 was spent by the commission during the last half of 1924, the total expenditure for valuation work by the commission and the carriers amounted to $106,487,893 on December 31, 1924.

Railroads in the vicinity of Trinidad, Colo., suffered severe damage as a result of a flood in the Purgatoire river on July 22. This flood was the result of a heavy rain over a territory of about 90 square miles, west of Trinidad, which attained its greatest severity in the Burro canyon, where the rainfall was estimated at about five inches in a period of 40 min. The damage to railway property occurred when the waters from the cloudburst rushed down the canyon of the Purgatoire river. They washed out a span of the Atchison, Topeka & Santa Fe bridge at Jansen, Colo., six miles west of Trinidad, and also part of the Trinidad yards. The passenger station and the Fred Harvey hotel were surrounded by water. The Denver & Rio Grande Western lost one of its bridges and several hundred feet of track in Trinidad. Two bridges of the Colorado & Wyoming, a subsidiary of the Colorado Fuel & Iron Company, were also destroyed. Many trains were delayed by the storm and the damage to the tracks.

Bureau of Safety Reports on Lackawanna Derailment

The Interstate Commerce Commission has issued a report of the Bureau of Safety with regard to the disastrous derailment which occurred near Hackettstown, N. J., on the Delaware, Lackawanna & Western on the morning of June 16. The conclusions presented in this report give the cause of the accident substantially as it appeared in the July issue of *Railway Engineering and Maintenance*, page 277. It neither ascribed the accident to a natural cause nor definitely condemned any officer or employee of the Lackawanna as contributing to the accident. The conclusions are given below:

"This accident was caused by earth and rocks being washed on the tracks at a point where they are crossed by a public highway.

"The evidence indicated that there had been an unusually heavy rain in the immediate vicinity of Rockport crossing and that earth and rocks had been washed down from the travelled part of the highway to the tracks of the railroad, filling the flangeways between the crossing planks and the

rails and also covering the rails to a depth of several inches, and this condition caused the forward pair of engine truck wheels to become derailed at the eastern end of the crossing. This pair of wheels then ran along the ties, close to the rails, until they reached the east switch of the crossover connecting the two main tracks, at which point the engine became entirely derailed, tearing up the track and resulting in the general derailment.

"No difficulty had been experienced at this crossing over a period of 25 years or more and it did not appear that any one connected with the railroad knew that in the immediate vicinity of the crossing there had been a storm of sufficient severity to endanger the safe passage of trains.

"One of the cars came to rest across the boiler of engine 1104 while a second car came to rest across the rear of the boiler; practically all of the appurtenances and fittings were torn from the boiler as a result of the accident, thus permitting steam and hot water to escape into these two cars, and undoubtedly this fact accounted for a great many of the fatalities which resulted from this accident.

"The employees involved were experienced men. At the time of the accident the engine crew had been on duty about 3 hours and the train crew about 4½ hours, previous to which they had been off duty for periods varying from 16 to 30 hours."

Walter Mason Camp, editor in chief of the Railway Review, Chicago, and for many years a well known authority on track maintenance, died in a hospital at Kankakee, Ill., on August 3, of Bright's disease. His death was sudden and occurred after it was thought a cure had been effected. Mr. Camp was born on April 21, 1867, at Campstown, Pa. In 1883, after he had spent four years working on farms and in the lumber woods, he was employed on the Lehigh Valley as a track walker and later as a chainman and rodman in the office of the division engineer. In 1887 he left railway service to resume his education, entering the course in civil engineering at Pennsylvania State College. He was graduated in 1891, after which he was employed as a surveyor on the Southern Pacific and as a draftsman in the office of the chief engineer at San Francisco. Mr. Camp was placed in charge of construction of the Rainier Avenue Electric Railway in Seattle, Wash., in 1892, and was later promoted to superintendent in charge of operation and maintenance. In 1894 and 1895 he was employed as a work train foreman, surveyor and section foreman on the Seattle, Lake Shore & Eastern, but he left that company in 1895 to take a post graduate course in electrical and steam engineering at the University of Wisconsin. For a short time in 1896, Mr. Camp was an instructor in electricity in the National School of Electricity, Chicago. Later in the same year he was appointed inspector of track construction of the Englewood and Chicago electric railway, later being promoted to superintendent of track construction. During this time he had charge of the construction of a counter-weight system at Morgan Park, Chicago. Mr. Camp was first employed on the Railway and Engineering Review, the predecessor of the Railway Review, in 1897, as engineering editor. He was later promoted to managing editor and then to editor in chief. Although he had been in ill health for some time previous to his death, his connection with the Railway Review was continuously maintained. Mr. Camp was known as an authority on railway track and his "Notes on Track" issued in 1904 are still considered an important contribution to the literature on the subject. He also collaborated as author of a book on railroad transportation at the St. Louis exposition.

W. M. Camp

Personal Mention

Engineering

L. J. Drumeller, whose promotion to assistant division engineer on the Baltimore & Ohio, with headquarters at Richmond, Va., was published in the August issue, was born at Richmond on September 13, 1897. He entered railway service in August, 1915, as a rodman on the Chesapeake & Ohio, which position he held until September, 1917, when he became draftsman. From December, 1917, until March, 1918, he served as instrumentman, on the latter date leaving railway service to become chief of a field party for the Dupont Powder Company. From April, 1918, to July, 1918, he served as an instrumentman on the Louisville & Nashville, on the latter date becoming a draftsman on the Missouri Pacific. He served in the United States Army from September, 1918, to December, 1918, and from that date has been employed in various engineering capacities on the Chesapeake & Ohio, until his recent promotion.

T. C. McCord, whose promotion to division engineer of the San Antonio division of the International-Great Northern, with headquarters at San Antonio, Tex., was reported in last month's issue, was born on July 28, 1889, at Tyler, Tex., and graduated from the Texas University Military Academy in 1909, when he entered the service of the Gulf Coast Lines. From June, 1900, until September, 1914, he served as rodman, masonry inspector, levelman, concrete gang foreman and instrumentman, on the latter date leaving the Gulf Coast Lines to become a rodman on the Missouri Pacific, later serving as foreman of work trains on grade separation work in St. Louis. He left that road to become instrumentman on the Eastern division of the Texas & Pacific, and in October, 1916, was transferred to the Mississippi Terminal Railway of New Orleans, as assistant engineer. From August, 1918, until his recent appointment he served continuously on the Gulf Coast Lines—International-Great Northern as assistant engineer, office engineer to the chief engineer, engineer-roadmaster of the Houston, Belt & Terminal at Houston, roadmaster of the First district, Gulf Coast Lines, and after the consolidation of the two roads, again served as office engineer to the chief engineer.

S. P. Coffin, division engineer of the Boston & Maine, with headquarters at Nashua, N. H., has been appointed division engineer of the Terminal division, with headquarters at Boston. **John J. Rourke,** division engineer of the Terminal division has been appointed chief of roadway machinery, with the same headquarters. **John P. Canty,** division engineer of the Berkshire division, with headquarters at North Adams, Mass., has been appointed division engineer of the combined Fitchburg-Berkshire division, with headquarters at Greenfield, Mass. **R. H. Park,** division engineer of the Fitchburg division, has been appointed division engineer of the White Mountains-Passumpsic division, with headquarters at Woodsville, N. H. **Frank E. Sampson,** division engineer at St. Johnsbury, Vt., has been transferred in a similar capacity to Springfield, Mass. **Guy H. Watson,** division engineer of the White Mountains division, has been appointed acting division engineer of the Portland division, with headquarters at Salem, Mass., succeeding **George K. Thornton,** who is acting engineer in charge of maintenance of way, with headquarters at Boston.

I. D. Waterman, assistant to the chief engineer of the New York, New Haven & Hartford and the Central New England, has been promoted to assistant chief engineer. He was born on February 18,1879, at South Weymouth, Mass., and was educataed at Lowell Institute and also took a Y. M. C. A. course in engineering. Mr. Waterman entered railway service in September, 1899, as axman and rodman on the Boston & Albany, which position he held until May, 1902, when he became instrumentman of the same road. From May, 1903, until January, 1904, he was a resident engineer on the Canadian Pacific, and from February, 1904, to September, 1905, he was a transitman on the New York, New Haven & Hartford. In September, 1905, he became assistant engi-

neer on the same road, and remained in this position until June, 1907, when he was promoted to second assistant engineer of construction. From October, 1907, to May, 1912, he was an assistant engineer of construction, and from May, 1912, to 1923, he held the position of engineer of construction of the same road. In 1923, he was promoted to assistant to the chief engineer, which position he held at the time of his recent promotion.

C. W. Breed, office engineer of the Chicago, Burlington & Quincy, with headquarters at Chicago, has been promoted to engineer of standards, with the same headquarters, a newly created position.

E. E. Adams, district engineer of the Central district of the Great Northern, with headquarters at Great Falls, Mont., has been transferred to the Western district, with headquarters at Spokane, Wash. **T. G. Hastie**, district engineer of the Western district, has been appointed assistant district engineer of the same district, with headquarters at Seattle, Wash. **Peter Hervin** has been appointed assistant district engineer of the Western district, with headquarters at Everett, Wash. These transfers are made pursuant to the consolidation of the Western and Central districts insofar as the engineering department is concerned, with headquarters at Spokane, Wash.

E. M. Grime, supervisor of bridges and buildings of the Fargo division of the Northern Pacific, with headquarters at Fargo, N. D., has been promoted to engineer of water service, with headquarters at St. Paul, Minn., a newly created position. Mr. Grime was born at Minneapolis, Minn., on July 1, 1876, and graduated from the University of Minnesota in 1900. He entered railway service on the Chicago Great Western in June of that year and from then until April, 1905, served consecutively as draftsman, instrumentman and assistant engineer on grade revision, bridge work and maintenance, on the latter date being promoted to division engineer, which position he held until May, 1907, when he became building inspector on the Northern Pacific. He left that road in January, 1908, to serve as an assistant engineer on the Stockyards Terminal railway, where he remained until June, 1908, when he returned to the Northern Pacific as an assistant engineer. He was appointed supervisor bridges and buildings in March, 1909, which position he was holding at the time of his promotion to engineer of water service. In September, 1924, he was appointed a member of the Water committee, of the railroad to make a survey and study of all water facilities on the main lines of the Northern Pacific and to recommend improvements.

E. M. Grime

The positions of the three district engineers on the Chicago, Milwaukee & St. Paul, lines west, have been abolished and instead authority has been granted for seven positions of division engineer. Under this change **Edward Murray**, district engineer at Miles City, Mont., has been appointed division engineer of the Musselshell division, with headquarters at Miles City. **F. M. Sloane**, district engineer at Butte, Mont., has been appointed division engineer of the Idaho division, with headquarters at Spokane, Wash. **J. F. Pinson**, district engineer at Seattle, Wash., has been appointed division engineer of the Coast division, with headquarters at Tacoma, Wash. **R. H. Smith**, assistant engineer at Seattle, has been promoted to division engineer of the Trans-Missouri division, with headquarters at Mobridge, S. D. **W. E. Ring**, assistant engineer at Miles City, has been promoted to division engineer of the Northern Montana division, with headquarters at Lewiston, Mont. **John Guinotte**, assistant engineer at Butte, has been promoted to division engineer of the Rocky Mountain and Missoula divisions, with headquarters at Deer Lodge, Mont. **C. A. W. Musson**, assistant engineer at Seattle, Wash., has been promoted to division engineer of the Olympic and Bellingham divisions, with the same headquarters.

Reuben Hayes, whose appointment to engineer maintenance of way of the Southwestern district of the Southern, with headquarters at Chattanooga, Tenn., was reported in the August issue, was born on September 14, 1884, at Madbury, N. H. He graduated from Dartmouth college in 1907, after which he attended Thayer School of Civil Engineering, graduating in 1908. He entered railway service on March 27, 1911, on the Southern, as an assistant engineer, which position he held until September 14, 1916, when he became resident engineer. On November 3, 1917, he was promoted to structural engineer, which position he was holding at the time of his promotion to engineer maintenance of way.

Wilfred C. Bolin, engineer in the valuation department of the Baltimore & Ohio, has been promoted to office engineer of the Baltimore & Ohio Chicago Terminal, with headquarters at Chicago. Mr. Bolin was born on November 1, 1885, at Newark, Ohio, and graduated from Denison university in 1909. He entered railway service in 1909 in the engineer corps of the Baltimore & Ohio and in 1912 became assistant division engineer of the Baltimore & Ohio Chicago Terminal. From 1915 to 1916 he served as an assistant supervisor of efficiency of the Baltimore & Ohio at Newark, Ohio, on the later date entering the valuation department at Chicago, serving as pilot engineer, a member of the Chicago Zone Cost committee and chairman of the Chicago General Land committee. In 1921 he was transferred to Baltimore, Md., as a pilot engineer, being placed also in charge of cost analysis, Union station at Washington, which position he was holding at the time of his appointment to office engineer.

W. Fields, roadmaster on the Gulf Coast Lines, with headquarters at Sinton, Tex., has been promoted to office engineer to the chief engineer of the International-Great Northern, with headquarters at Houston, Tex. Mr. Fields was born on February 25, 1890, at Wellsville, Mo., and attended Central Wesleyan college. He entered railway service in October, 1911, on the Midland Valley, and from that date until November, 1912, served as chainman, rodman and instrumentman on preliminary location and construction, on the latter date becoming levelman and inspector for Harris county, Tex., at Houston, later serving as instrumentman for the San Benito Land & Water Company at San Benito, Tex. From October, 1914, to July, 1915, he was employed as levelman with the St. Louis, Brownsville & Mexico, and also with the proposed Brownsville-Point Isabel, when he again became instrumentman and inspector for Harris county. In June, 1917, he entered the service of the Beaumont Ship Building & Dry Dock Company, as assistant engineer, where he remained until October, 1917, when he became assistant engineer on the Gulf Coast Lines. From February 1, 1918, to June 24, 1919, he served in the United States Army as a master engineer with the 32nd Engineers, returning to the Gulf Coast Lines in August, 1919, as assistant engineer, later becoming roadmaster, which position he was holding at the time of his promotion to office engineer to the chief engineer.

Track

Hugh B. Cassidy has been appointed assistant roadmaster on the Chicago, Rock Island & Pacific, with headquarters at St. Joseph, Mo.

H. L. Barr, engineer-draftsman in the office of the engineer maintenance of way of the Chicago & North Western, has been appointed roadmaster at Lusk, Wyo., succeeding **D. V. O'Connell**, who has been transferred to Winona, Minn., to succeed **G. H. Clayton**, resigned. **J. J. Dwyer**, assistant roadmaster, has been promoted to roadmaster at Escanaba, Mich., succeeding **J. A. McKittrick**, resigned.

R. R. Blair, roadmaster on the Alamogordo district of the Southern Pacific, Pacific system, with headquarters at Alamogordo, N. M., has been transferred to the Benson district, with headquarters at Benson, Ariz., succeeding **P. Grimley**,

assigned to other duties. **L. U. McKenzie**, roadmaster on the Tucumcari district, with headquarters at Tucumcari, N. M., has been transferred to Alamogordo, succeeding Mr. Blair. **J. B. Dinwiddie** has been appointed roadmaster at Tucumcari, succeeding Mr. McKenzie. Mr. Dinwiddie was born on March 11, 1886, at Plano, Tex., and entered railway service as a section laborer on the Texas & Pacific. On July 3, 1912, he became an apprentice foreman on the El Paso & Southwestern, now a part of the Southern Pacific, being promoted to foreman on July 1, 1913. He was employed on various extra gangs from July 1, 1915, to February, 1917, serving as foreman in the Carrizozo yards from March, 1920, to July 15, 1925, when he received his promotion to roadmaster.

Andrew Reedy, extra gang foreman on the Chicago, Milwaukee & St. Paul, has been promoted to roadmaster at Terre Haute, Ind., succeeding **F. B. Moberly**, resigned.

F. McNutt, roadmaster on the Los Angeles division of the Atchison, Topeka & Santa Fe, with headquarters at Los Angeles, Cal., has been appointed inspector of track and roadway, with the same headquarters, succeeding **Frank S. Purdy**, whose death is reported elsewhere in this issue. **A. L. Pollock**, roadmaster on the Albuquerque division, at Williams, Ariz., has been transferred to Los Angeles, succeeding Mr. McNutt. **Ed Conway**, roadmaster on the Albuquerque division, at Dalies, N. M., has been transferred to Williams, succeeding Mr. Pollock. **J. B. Warren**, formerly acting roadmaster on second-track construction, has been appointed roadmaster at Dalies, N. M., succeeding Mr. Conway.

G. C. McCorkle, whose appointment to the position of roadmaster on the Indianapolis division of the New York, Chicago & St. Louis, with headquarters at Tipton, Ind., was published in last month's issue, was born on January 22, 1892, at Kokomo, Ind. He entered railway service on September 15, 1913, as a clerk in the bridge and building department of the New York, Chicago & St. Louis, at Tipton, Ind., where he remained until May 23, 1917, when he became chief clerk in the bridge and building and signal departments, with the same headquarters, which position he held until June 5, 1922. From then until April 1, 1925, he served as chief clerk in the engineering department, on the latter date being given charge of the track department of the Ft. Wayne division of the Lake Erie & Western district, where he remained until this recent appointment.

E. H. Lewis, whose promotion to track supervisor of the Illinois Central, with headquarters at Jackson, Miss., was reported in the July issue, graduated in civil engineering from the University of Kentucky in 1910, and entered the service of the Illinois Central as a chainman on August 29 of the same year. From that date until February 15, 1917, he served consecutively as chainman, rodman and instrumentman on maintenance and construction, on the latter date was transferred to the valuation department as computer and assistant engineer, where he stayed until January, 1918, when he served in the United States Army until April, 1919. He returned to the Illinois Central in April, 1919, as an assistant engineer in the maintenance of way department, which position he was holding at the time of his promotion to track supervisor.

F. J. Parkhurst, whose appointment to supervisor of track on the Chicago division of the New York, Chicago & St. Louis, was reported in the August issue, was born at Clyde, Ohio, on June 6, 1881, and entered railway service as an expense clerk with the Lake Shore & Michigan Southern in December, 1900. From January 1, 1901, to July 3, 1901, he served as shipping and material laborer in the track department store house of the Nickle Plate at Bellevue, Ohio, on the latter date becoming supervisor's clerk at Ft. Wayne, Ind. He was transferred to Cleveland, Ohio, and later to Lorain, in September, 1901. From 1904 to 1905 he served respectively as extra gang foreman, supervisor's clerk and acting supervisor's assistant on the Cleveland and Chicago divisions at various points, becoming roadmaster's clerk on the Lake Erie & Western at Peru, Ind., in March, 1905, where he remained until December, 1911, when he was promoted to roadmaster. He was transferred to Tipton, Ind., in August, 1918, and held this position at the time of his appointment to supervisor of track.

Bridge and Building

Kemper Peabody, supervisor of piers and buildings of the New York Central in the marine district, New York, has been promoted to general supervisor of buildings, with the same headquarters, succeeding **W. A. Pettis**, deceased. **E. L. Jenkins**, assistant supervisor of bridges and buildings, with headquarters at Utica, N. Y., has been promoted to supervisor of bridges and buildings at Malone, N. Y., succeeding **E. R. Tattershall**, promoted to supervisor of piers and buildings to succeed Mr. Peabody. **A. C. Tanner**, pile driver foreman, has been promoted to assistant supervisor of bridges and buildings at Watertown, N. Y., succeeding **Isaiah Vosburgh**, transferred to Utica vice Mr. Jenkins.

Purchasing and Stores

G. V. Green has been appointed purchasing agent of the Southern Pacific of Mexico, with headquarters at Tucson, Ariz.

. E. Harty, district storekeeper of the Southern Pacific, with headquarters at Sacramento, Cal., has been promoted to assistant general storekeeper, with headquarters at San Francisco, a newly created position. **E. H. Polk**, district storekeeper, with headquarters at West Oakland, Cal., has been transferred to Sacramento in place of Mr. Harty. **H. W. Concannon**, division storekeeper, with headquarters at Ogden, Utah, has been promoted to district storekeeper at West Oakland, succeeding Mr. Polk. **J. F. Brown**, division storekeeper, with headquarters at Bakersfield, Cal., has been transferred to Ogden in place of Mr. Concannon. **F. L. Doss**, division storekeeper, with headquarters at Dunsmuir, Cal., has been transferred to Bakersfield, Cal., succeeding Mr. Brown.

Joseph V. Miller has been appointed assistant general storekeeper of the Chicago, Milwaukee & St. Paul. He was formerly western sales representative of the Prime Manufacturing Company, Milwaukee, Wis. **F. J. O'Connor**, assistant storekeeper, with headquarters at Milwaukee, Wis., has been promoted to assistant purchasing agent, with headquaters at Chicago, succeeding **G. R. Cooke**, who has resigned.

B. T. Adams, division storekeeper on the Illinois Central, with headquarters at Paducah, Ky., has been promoted to assistant general storekeeper of the Southern lines, the Yazoo & Mississippi Valley and the Gulf & Ship Island, with headquarters at Memphis, Tenn., succeeding **W. D. Stokes**, deceased.

Obituary

F. D. Kilpatrick, member of the firm of pioneer railroad builders, Kilpatrick Brothers, which constructed a large part of the line of the Union Pacific, Central Pacific and Oregon Short Line, died on July 18 at Beatrice, Neb.

Albert L. Oliphant, roadmaster of the Southern Kansas division of the Atchison, Topeka & Santa Fe, with headquarters at Chanute, Kan., died on June 19, as the result of a motor car accident.

Frank S. Purdy, inspector of track and roadway on the Coast lines of the Atchison, Topeka & Santa Fe, with headquarters at Los Angeles, Cal., died in that city on July 3, after a short illness. Mr. Purdy was born on a farm near Lewistown, Ill., on September 17, 1867, and at the age of 13 began working for his father, who was a railroad contractor. He entered railway service on April 28, 1891, as a section foreman on the Atchison, Topeka & Santa Fe at Fullerton, Cal.; in April, 1895, he was promoted to extra gang foreman and in September of the same year was made general foreman of extra gangs. In 1906 he was promoted to roadmaster, with headquarters at Winslow, Ariz., and six months later was transferred to the Los Angeles division. He was appointed inspector of track and roadway, with headquarters at Los Angeles, Cal., in November, 1921, which position he was holding at the time of his death.

The Brotherhood Investment Company, a subsidiary of the Brotherhood of Locomotive Engineers, has purchased 27,000 acres of land on the Gulf of Mexico seven miles south of Sarasota, Fla.

Construction News

The Alton & Southern has applied to the Interstate Commerce Commission for authority to issue $350,220 in capital stock to be used on the construction of a single track line from Granite City, Ill., to Mitchell.

The Atchison, Topeka & Santa Fe is receiving bids for the construction of a passenger station at Monrovia, Cal., to cost $75,000, as reported in the July issue. Bids were closed on August 14 for the construction of a water treating plant at Slaton, Tex., to cost $40,000. This company also closed bids on August 11 for the construction of a freight house at Las Vegas, New Mexico. A contract has been awarded to Jerome A. Moss, Chicago, for the construction of a fruit terminal warehouse at Chicago, to cost $250,000. The building will be of brick construction, four stories in height, and its dimensions will be 100 ft. by 800 ft. The contract for the construction of pavement for team tracks adjacent to the fruit terminal warehouse has also been awarded to Jerome A. Moss. This company is making surveys in contemplation of the construction of an extension from Floydada, Tex., eastward to Benjamin, a distance of approximately 100 miles.

The Atlantic Coast Line is reported to have awarded a contract to J. M. Lawton & Company for the construction of a 14 stall addition to the roundhouse at Florence, S. C.

The Baltimore & Ohio has awarded a contract to the James F. McCabe Company, Baltimore, Md., for the renewing of the substructure of a bridge at Folsom, W. Va. The work will entail an expenditure of approximately $42,000. A contract has also been awarded to the Sheesley & Janney Construction Company, Johnstown, Pa., for masonry work for three bridges to eliminate grade crossings at Greendale, Ill., to cost approximately $40,000.

The Boston & Albany has received bids for the construction of a seven-story office building at East Cambridge, Mass., to cost approximately $400,000. The contract for the foundation of the structure, to cost about $17,000, has been awarded to T. Stuart & Son Company, Newton, Mass. A contract has been awarded to the Boston Bridge Works, Boston, for rebuilding a bridge at Fitchburg, Mass., to cost approximately $19,000.

The Boston & Maine will build a general office building for use by this company on property which it owns near Lechmere square, Cambridge, Mass. Space vacated in North station will be utilized for business purposes and general offices now housed in other buildings will be brought under one roof in the new structure. A fireproof building, 51 ft. by 305 ft., of seven or eight stories is planned.

The Brooksville-Inverness, to be organized in the interest of the Seaboard Air Line, has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line connecting the Tampa Northern at Brooksville, Fla., with the Seaboard at Holder, Fla., 18.74 miles.

The Canadian National has awarded a contract to Dutton, Roasa & Wistrand, Winnipeg, Man., for the grading of the Willowbunch, Man., branch line, 28 miles long. A contract has been awarded to J. G. Hargrave & Co., Ltd., Winnipeg, for the grading of the 21-mile St. Paul de Metis branch and the 44-mile Turtleford, Sask., branch. Bids were closed on July 27 for the grading on the 20-mile Pine Falls branch from Beaconia, Man., to Port Alexander.

The Central of New Jersey has awarded a contract to the Bethlehem Steel Company for the furnishing and erection of the superstructure of a viaduct at the east end of the company's bridge over Newark Bay, now under construction.

The Central Pacific has applied to the Interstate Commerce Commission for a certificate authorizing it to construct a new line from a point near Weed to Grass Lake, Cal., to be known as the Black Butte cut-off, 23 miles. The object of the projected line is to get proper use of the Natron cut-off now under construction between Kirk and Oakridge, Oregon. The new line would connect the Shasta division of the Central with its Klamath Falls branch.

The Chesapeake & Ohio has awarded a contract to Haley, Chisholm & Morris, Charlottesville, Va., for the construction of a reinforced concrete underpass at Russell, Ky., to cost $60,000. This company has authorized the construction of approximately 10 miles of second track between Waverly, Ohio, and Portsmouth.

The Chicago, Milwaukee & St. Paul will construct a roundhouse at Sioux City, Iowa, to replace a 15-stall roundhouse destroyed by fire on August 4. Negotiations are now under way for the financing of the reconstruction of a grain elevator at Milwaukee, Wis., which was destroyed by fire last year. The cost of reconstruction, including machinery, is estimated at $300,000.

The Chicago, Rock Island & Pacific has received authorization from the Interstate Commerce Commission for the construction of two extensions, one from Liberal, Kan., southwest to Amarillo, Tex., a distance of 145 miles, and the other from Billings, Okla., northeast to Ponca City, a distance of approximately 30 miles.

The Cleveland, Cincinnati, Chicago & St. Louis has awarded a contract to the Walsh Construction Company, Chicago, for the construction of a freight office building at East St. Louis, Ill., to replace a building recently destroyed by fire. The new building will be of brick construction 40 ft. by 200 ft. and three stories in height. A contract has been awarded to the Davis Hunt Construction Company, Dayton, Ohio, for the construction of a freighthouse and office building at Dayton, to cost approximately $175,000.

The Cowlitz, Chehalis & Cascade has awarded a contract to Graham Brothers & Medley, Chehalis, Wash., for the grading of a six-mile extension from the present terminus of the line near Lacamas, Wash., to Salkum. The contract for the grading of the remainder of the 14-mile extension from Lacamas to Mossy Rock, reported in the August issue, will be awarded soon.

The Denver & Rio Grande Western has withdrawn application made early this year to the Interstate Commerce Commission for authority to construct a branch line from Soldier Summit, Utah, to Vernal, a distance of 132 miles. This company has awarded a contract to the Utah Construction Company, Ogden, Utah, for restoration of roadbed on the Salina Canyon branch line in Utah. The Salina Canyon branch is approximately 20 miles long.

The Florence, Clifton & Paducah has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Florence, Ala., to Paducah, Ky., 225 miles, and a branch from a point in Wayne county, Tenn., to Savannah, Tenn., 25 miles. A. B. Campbell, of Florence, Ala., is president.

The Golden Belt has renewed its application before the Kansas Public Utilities Commission for authority to construct a north and south railway in central western Kansas from Great Bend to Hays, 52 miles, with the intention of later building to Phillipsburg, 50 miles further. This company twice has been refused authority to build the line both by the Kansas Public Utilities Commission and by the Interstate Commerce Commission in 1922 and 1924.

The Grand Trunk Western has awarded a contract to the Federal Cement Tile Company, Chicago, for concrete cribbing units for 25,000 sq. ft. of retaining walls to be built in connection with the West Detroit grade separation project.

The Gulf Coast Lines has awarded contracts for the construction of 80,000-barrel oil storage tanks at Hearne, Tex., and Harlingen; a 65,000-barrel oil storage tank at Kingsville, Tex., and a 55,000-barrel oil storage tank at Houston, Tex. Plans are being prepared for the construction at DeQueen, La., of a 38-ft. by 350-ft. car repair shop, a 140-ft. by 170-ft. metal shop, a machine shop and other buildings.

The Houston, Beaumont & Orange (Electric) has awarded a contract to W. H. Nichols & Co., Houston, Tex., for the construction of an interurban line from Houston, Tex., to Orange, a distance of 125 miles.

The Illinois Central contemplates the construction of a two story concrete brick warehouse building at Freeport, Ill., to cost approximately $250,000. This company will call for bids within 30 days for the construction of a suburban passenger

terminal at Randolph street, Chicago, to cost approximately $2,000,000. Plans for the structure are nearly completed.

The International-Great Northern has awarded a contract to W. C. Thrailkill, San Antonio, Tex., for the construction of a suburban passenger station at North San Antonio to cost $37,000, reported in the August issue. A contract has also been awarded to Walker & Elder, San Antonio, Tex., for the construction of an extension from Raymondville, Tex., to Edinburgh, a distance of 30 miles. There will be two branches leading off of this line, one about half way between Edinburgh and Raymondville, running southward a distance of 10 miles, and the other will leave the line near Allendale and extend in a westerly direction a distance of 10 miles to a connection with the San Benito & Rio Grande Valley. The total estimated cost of the line to be built is $730,000.

The Louisiana Railway & Navigation Company has been authorized by the Public Service Commission of Louisiana to abandon a line 17.2 miles in length from a point below Moreauville to Naples, and to build a new line 19 miles in length from the point below Moreauville to a point on the right bank of the Mississippi in the parish of Pointe Coupee, opposite Angola, and to construct a bridge across the Atchafalaya river, near Simmsport.

The Michigan Central is asking for bids for a new steel superstructure for a bridge over the Cold Water river near Union City, Mich. A contract has been placed with the Ellington Miller Company, Chicago, for a one-story brick station at Detroit, Mich., to cost $300,000.

The Missouri Pacific, jointly with the city of Little Rock, Ark., plans to construct a concrete viaduct over its tracks at Main street in Little Rock at a cost of approximately $180,000.

The National Railways of Mexico through the department of Communications at Mexico City has stated that branch lines in the state of Chiapas will be constructed at an approximate cost of $2,500,000.

The New Mexico Central has been authorized by the Interstate Commerce Commission to construct approximately 100 miles of line northwest from Gallina, N. M., at a cost estimated at $2,106,525 (which the commission believes too low) provided that not more than 50 per cent of the capital required for making the improvement is raised by the issue of bonds. Construction must be begun by January 1, 1926, and completed within two years.

The New York Central has awarded a contract to the Edward J. Duffy Company, Inc., Weehawken, N. J., for the construction of a station on the West Shore at Teaneck, N. J., to cost approximately $60,000. A contract for a station at Fordham, New York City, to cost approximately $90,000, has been awarded to the Wm. L. Crow Construction Company, New York.

The Norfolk & Western has awarded a contract to J. P. Pettyjohn & Co., Lynchburg, Va., for an extension to its enginehouse at Williamson, W. Va., at an estimated cost of $30,000.

The Pacific Electric plans the construction of a passenger station at Huntington Park, Los Angeles, Cal., to cost $30,000.

The Pennsylvania has awarded a contract to the Milliron Construction Company, Du Bois, Pa., for the construction of an overhead bridge to eliminate a grade crossing at Waterford, Pa. The Hecker-Moon Company, Cleveland, Ohio, has a contract for grading, masonry and track work for a spur track at Fultonham, Ohio, to cost approximately $150,000. A contract has been awarded to L. Schiavoni, Girard, Ohio, for masonry for a bridge over Liberty street, that city. This company has asked for bids as of September 1 for the construction of a 14-story office building on Thirty-second street, north of Market street and Lancaster avenue, Philadelphia, to be occupied by employees who are now located on Filbert street and in other buildings in which space is rented.

The Quanah, Acme & Pacific's orginal plans to construct an extension from MacBain, Fla., to Floydada, a distance of 27 miles, have been changed to begin the construction at Roaring Springs, Tex., instead of MacBain.

The San Antonio & Aransas Pass has applied to the Interstate Commerce Commission for a certificate authorizing construction of an extension from Edinburgh, Hidalgo county, Tex., to Harlingen, Cameron county, a distance of 30 miles, to provide an outlet for a rich agricultural section in the two counties on the north side of the Rio Grande.

The Southern Pacific has awarded a contract to the Missouri Bridge & Iron Co. for the construction of a bridge over the Gila river at Wellton, Ariz., and on the new main line across Arizona.

The St. Louis, Brownsville & Mexico, which had previously been authorized by the Interstate Commerce Commission to construct a 28-mile line from Lyford, Tex., to Edinburgh, has now been authorized to use a slightly different route for the line and to construct two branch lines, making the total mileage to be constructed approximately 50; estimated cost $773,319, of which $118,400 represents right-of-way, which may be donated.

The St. Louis-San Francisco, jointly with the **Missouri-Kansas-Texas** and the **Atchison, Topeka & Santa Fe**, contemplates the construction of a union station at Tulsa, Okla., to cost $1,500,000.

The Union Pacific has awarded contracts to T. J. Sullivan, Denver, Colo., for the construction of a one-story storehouse at Council Bluffs, Iowa, to cost $60,000 and for the construction of a passenger station and freight station at Topeka, Kan., to cost a total of $400,000.

The Wabash has awarded a contract to W. W. Wuelner & Sons, St. Louis, Mo., for the construction of a passenger station at Centralia, Mo. This company contemplates the construction of a bridge across the Sangamon river at Decatur, Ill. Plans are also being prepared for the construction of a passenger station at Granite City, Ill. Bids were closed on August 11 for the construction of a roundhouse and service building at North Kansas City, Mo., to cost $100,000. This company has also awarded a contract to Jerome A. Moss for the construction of a passenger station including paving, at Taylorville, Ill., to cost $48,000. A contract has been awarded to Dwight P. Robinson & Company, New York, for the construction of a one story, 60 ft. by 120 ft., brick and steel machine shop building at Decatur, Ill.

Equipment and Supplies

The Cleveland, Cincinnati, Chicago & St. Louis is inquiring for 6,000 angle bars.

The Great Northern has ordered 12,000 tons of rail from the Illinois Steel Company and 5,000 tons from the Inland Steel Company. This is in addition to the 10,000 tons ordered from the Bethlehem Steel Company.

The Great Northern has ordered 10,000 tons of rail, with angle bars, from the Bethlehem Steel Company.

The Louisville, Henderson & St. Louis has ordered 3,000 tons of rail from the Illinois Steel Company.

In a statement issued by the western lines, with the exception of the Chicago, Milwaukee & St. Paul and the Minneapolis & St. Louis, the western lines have definitely indicated what advantages in freight rates they will ask the Interstate Commerce Commission to grant them. According to their statement an increase of approximately 11 per cent in rate would be necessary on the basis of the tonnage and earnings in 1924, to enable the railways of western territory to earn a net operating income of 5¾ per cent. However, they propose to ask an advance in rates which, it is hoped, will increase their average revenue by five per cent, with the hopes that this advance, together with such relief as may be granted by the Interstate Commerce Commission in other readjustments may avoid the necessity of greater general increase.

The construction of a line from Salt Lake City, Utah, to connect with the Denver & Salt Lake at Craig, Colo., is proposed by a group including Harry H. Berger, Los Angeles, Cal., Alexander Berger, Fredericksburg, Va., and others. The estimated cost is $15,000,000.

Supply Trade News

General

The Air Reduction Sales Company, New York City, has purchased the assets and assumed the liabilities of the Gas Tank Recharging Company, incorporated in 1913. The Gas Tank Recharging Company owned and operated acetylene plants at Milwaukee, Wis., and Bettendorf, Iowa; and a carbide plant at Keokuk, Iowa, where they manufactured Sun-Lite brand carbide.

The Weir Frog Company, Cincinnati, Ohio, and the **Kilby Frog & Switch Company,** Birmingham, Ala., have been consolidated through the purchase of the stock of W. W. Stringfellow, president of the Kilby Frog & Switch Company, by the Weir Frog Company. The two plants will be operated separately. **E. M. Kilby,** vice president of the Kilby Frog & Switch Company, has been appointed president and general manager of the Birmingham plant.

J. W. Cain & Company, Houston, Texas, has been appointed southwestern representative for the Orton & Steinbrenner **Company.** The **Burnite Machinery Company,** Denver, Colo., has been appointed western representative of the Orton & Steinbrenner Company.

Personal

Edgar J. Correll, formerly division engineer of the Baltimore & Ohio, with headquarters at Akron, Ohio, has been appointed vice-president of the **Anchor Company,** with headquarters in a newly opened office in Chicago. He was born in Canton, Ohio, and was educated at Ohio Northern University. He entered railway service in September, 1896, as a rodman on an engineering corps on the Baltimore & Ohio Southwestern, now a part of the Baltimore & Ohio, and in 1897 was promoted to assistant engineer. In March, 1898, he became a draftsman, which position he held until March, 1903, when he was promoted to assistant division engineer. He was afterwards promoted to division engineer with headquarters at Chillicothe, Ohio, and was later transferred to Akron, Ohio, which position he has held until his recent appointment.

E. J. Correll

E. B. Harkness, assistant secretary and assistant treasurer of the **Illinois Steel Company,** Chicago, has been promoted to secretary; **A. W. Carlisle,** cashier, has been promoted to treasurer, and **H. Morrison** has been appointed auditor and a director of the company, following the death of **Thomas J. Hyman,** who occupied the position of secretary-treasurer and auditor.

E. E. Goodwillie, district sales agent of the **Bethlehem Steel Company,** with headquarters at Chicago, has been appointed steel sales representative on the Pacific Coast, with headquarters in San Francisco, Cal., to succeed **Leigh B. Morris,** resigned. **John F. Hennessy,** district sales agent, with headquarters at Cincinnati, Ohio, has been transferred to Chicago, to succeed Mr. Goodwillie.

W. O. Duntley, former president of the **Chicago Pneumatic Tool Company,** who retired in 1918, died in a sanitarium near Chicago on July 27. He had suffered a nervous breakdown several months before. Mr. Duntley was born in Wyandotte, Mich., in 1867, and was employed as a salesman for the Chicago Pneumatic Tool Company at Chicago in 1894. He was later promoted successively to general sales agent, general manager, and vice president, and in 1909 was elected president. Mr. Duntley retired in 1918, partly on account of ill health and partly to enable himself to devote more attention to his private interests.

G. L. Walters, manager of sales, railroad and brass department of the **Adams & Westlake Company,** Chicago, has been elected treasurer of the company. **W. H. Baldwin,** formerly vice president and treasurer, continues as vice president. **A. S. Anderson,** representative at Chicago, has been promoted to general sales manager, with the same headquarters. **William J. Piersen,** representative at Chicago, has been promoted to western sales manager, with the same headquarters. **H. G. Turney,** representative at Chicago, has been promoted to southern sales manager, with the same headquarters. The positions of general sales manager, western sales manager and southern sales manager are newly created. Mr. Walters was born in Chicago and entered the employ of the Adams & Westlake Company as a factory clerk in 1890. Later he entered the sales department and in 1908 was promoted to manager of sales of the railroad department. In 1911 his duties were extended and he was made manager of sales, railroad and brass department, which position he held until his recent promotion.

G. L. Walters

Fred M. Randlett has been appointed district manager in the Pacific northwest territory for the **Robert W. Hunt Company,** inspecting, testing and consulting engineers, with general offices at Chicago. Mr. Randlett has been chief engineer of the water department of Portland, Oregon, for the past eight years, and previous to that service he was in the engineering department of the New York, New Haven & Hartford and Stone & Webster, Inc.

Trade Publications

What Rust Can Do.—The Detroit Graphite Company has issued a folder showing various types of structures exposed to the elements and emphasizing the deterioration that occurs unless they are properly protected, setting forth the merits of its Degraco paint for this purpose.

The Fogarty Digging Bucket.—The McMyler Interstate Company has issued a four-page leaflet describing this bucket, which this company has recently taken over and which is adapted particularly for trench work and, in the larger sizes, for river and harbor dredging. This leaflet describes the bucket and the character of work for which it is particularly adapted. It also contains a sketch, with the dimensions.

New Track Appliance Catalog.—The Kilby Frog & Switch Company, Birmingham, Ala., has just issued catalog No. 10, which lists, describes and illustrates the various track appliances manufactured by that company. These include frogs, switches, crossings switch stands, rail braces, guard rails, clamps, compromise joints, track bolts, etc.

Advance Motor Car Engine.—In a leaflet of one sheet known as Bulletin 210, Fairmont Railway Motors, Inc., presents a detailed description and illustrations of the new Fairmont engine known as the Type QB, which is said to comprise a distinct improvement over the six-horsepower Fairmont engine previously installed in the motor cars manufactured by that company. The improvements in this engine include larger bearings, a new sliding base, a new timer and other features.

THE OXWELD RAILROAD SERVICE COMPANY

representing

THE LINDE AIR PRODUCTS CO.
(Linde Oxygen)

THE PREST-O-LITE CO., Inc.
(Prest-O-Lite Acetylene)

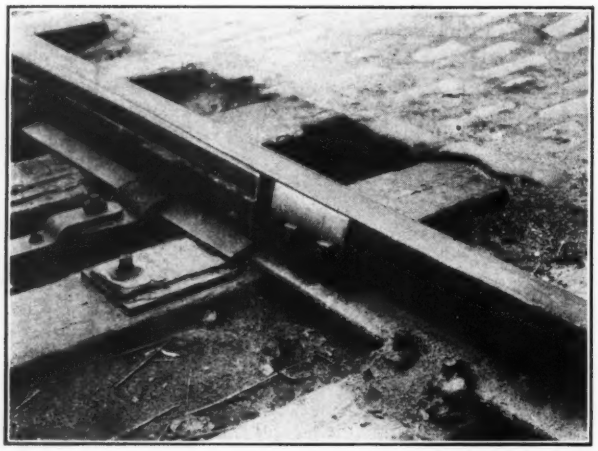
UNION CARBIDE SALES CO.
(Union Carbide)

OXWELD ACETYLENE CO.
(Oxweld Apparatus and Supplies)

Railway Exchange
Chicago

30 East 42d Street
New York

The "Mack" Switch Point Protector



An Economic Device
A Safety Device

Let the Mack Switch Point Protector absorb the wear and increase the life of your switch points.

Mack Switch Point Protectors are simple, inexpensive, and positive in action. For switch points to last ten times longer with this protection is not uncommon in actual service tests.

Mack Switch Point Protectors perform two essential functions—aiding in more economical maintenance by greatly prolonging the life of switch points,—and as a safety device by eliminating the possibility of derailment at switches.

Installation can be made easily at small cost—replacements are made in a few minutes by one man—their efficiency is not impaired by weather conditions.

Write

J. R. FLEMING & SON CO., Inc.
SCRANTON, PA.

PATENTED IN U. S. AND FOREIGN COUNTRIES

WHARTON

TRACKWORK

IS KNOWN the world over—for since the beginning of the railroad industry this company has been inseparably associated in the design and application of better track work.

The severest pounding of modern power only serves to demonstrate the greater endurance of Wharton equipment.

We are prepared to furnish designs suited to individual standards of railroads or special designs as requested. Switches — Frogs — Crossings—of TISCO Manganese Steel.

Wm. Wharton Jr. & Co., Inc.
Easton, Pa.

PUMPS

A TYPE FOR EVERY SERVICE

Bulletins on request

THE GOULDS MANUFACTURING COMPANY

SENECA FALLS, N. Y.

GOULDS

"How Soon Can You Deliver?"

ASSURANCES of time of shipments and deliveries are based on actual knowledge of manufacturing and shipping conditions at our plants.

Prompt shipments of explosives are made because of the ample stocks available at plants and in storage magazines located in regions where industries require our products.

This nation-wide ability to serve industry promptly with explosives of the highest quality is only *one* of the reasons why du Pont enjoys leadership in the explosives field.

Blast with du Pont Explosives

There is a du Pont explosive to meet every blasting need—to do *your* particular work *best* at *least* expense. For contracting we especially recommend:

Red Cross Extra Dynamite: 20% to 60% strength; low-freezing; fairly water-resisting; heaving and lifting action.

Du Pont Gelatin Dynamite: 25% to 90% strength; water-resisting; low-freezing; dense; plastic; less obnoxious fumes.

Du Pont R. R. P. (Judson Type): 5% strength and low-freezing.

Du Pont Blasting Powder is the most widely used low explosive. It is regarded as standard everywhere. Every keg bears the orange band.

Du Pont blasting accessories give you maximum efficiency from your explosives. Make every shot *sure*—protect your blasting investment by using only du Pont accessories.

For further information about du Pont explosives and blasting accessories, please refer to Road and Street Catalog—or write to our nearest office.

Du Pont chemical engineers insure uniformity of quality by chemical control through every step of manufacture from raw material to finished product.

E. I. DU PONT DE NEMOURS & CO., INC.
Explosives Department
WILMINGTON, DELAWARE

DU PONT

Branch Offices:

Birmingham . . . . Ala.
Boston . . . . . Mass.
Buffalo . . . . . N. Y.
Chicago . . . . . Ill.
Denver . . . . . Colo.
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El Paso . . . . . Tex.
Huntington . . . W. Va.
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Kansas City . . . . Mo.
Mexico City . . . . Mex.
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Springfield . . . . . Ill.

Du Pont Products Exhibit Atlantic City, N. J.

POWDER MAKERS SINCE 1802

JORDAN SPREADER

The Composite Spreader-Ditcher, which is the Jordan Spreader with the composite Spreader-Ditcher Attachment, performs all the functions of the Spreader (moves earth, spreads bulky materials, plows snow) and in addition will shape the ballast and subgrade, form new ditches or clean old ones, and trim the banks of cuts to a uniform slope.

JORDAN SPREADER
"Does the Work of an Army of Men"
SNOW PLOW * ICE CUTTER * UNIVERSALLY STANDARD DITCHER
O. F. JORDAN COMPANY
WALTER J. RILEY, PRESIDENT
EAST CHICAGO, INDIANA

An all-year Machine. In use on North America's leading railroads.

Write for Copy of New Catalog

The Frog, Switch & Manufacturing Company
Carlisle Pennsylvania

Established 1881

FROG AND SWITCH DEPARTMENT
MANUFACTURERS OF
MANGANESE INSERT FROGS, CROSSINGS AND SPLIT SWITCHES
SOLID MANGANESE FROGS AND CROSSINGS
PLAIN FROGS, SWITCHES, CROSSINGS
SWITCH STANDS AND ACCESSORIES

MANGANESE STEEL DEPARTMENT
MANUFACTURERS OF
"INDIAN BRAND"
HIGH GRADE MANGANESE STEEL CASTINGS
FOR FROGS, SWITCHES AND CROSSINGS
JAW AND GYRATORY CRUSHERS
CEMENT MILL, MINING MACHINERY, ETC.
GRAY IRON CASTINGS

WATER PUMPS WATER

with a RIFE HYDRAULIC RAM without fuel, labor, freezing or repairs. A small stream operates the Rife Hydraulic Ram and fills water tanks. Easy to install. No attention required. Used by over fifty railroads, among which are:

Delaware, Lackawanna & Western R. R.
Baltimore & Ohio R. R. Co.
Southern R. R. Co.
Norfolk & Western Ry. Co.
Gulf & Ship Island R. R.
Boston & Maine R. R. Co.
Cuba Railroad Co.
Canadian National Railway
Sorocabana Ry. Co., Brazil.
Mexican R. R. Co.
Seaboard Air Line, Ga.
National Railroads of Mexico
Detroit & Mackinac R. R.
Panama Railway Co.
Crystal City & Uvalde R. R.

The American Railway Engineering Association voted approval of pumping water by means of hydraulic rams where they can be used, at the Convention which was held in Chicago March 10th to 12th.

Manufactured in nine sizes up to and including 12 inch, the largest Ram which can be successfully used under all conditions.

Write for catalogue complete on Rife Hydraulic Rams.

RIFE ENGINE COMPANY **1602 West Street Building, New York, N. Y.**

Stop! wasting money on R.R. RAIL ROAD CROSSING INGS

BITUROC Crossing, Fortville, Ind.

Construct Them With

BITUROC
TRADE - MARK

Natural Kentucky Rock Asphalt

BITUROC Crossing, Cincinnati, O.

Bituroc is a natural bituminous sandstone quarried and pulverized at our plant at Summit, Hardin County, Kentucky.

Bituroc is the most practical pavement for railroad crossings because it is delivered on the job ready to be laid COLD. Any section crew with the aid of rakes and a roller (large one not necessary) can lay it satisfactorily.

Bituroc is waterproof, noiseless, dustless and exceptionally non-skid.

Bituroc, due to its elasticity and resiliency, will withstand the vibration and impact of combined vehicular and rail traffic, where a more rigid type of pavement will crack and disintegrate under the strain.

Bituroc is also used extensively for station platforms, roadways, walks, etc.

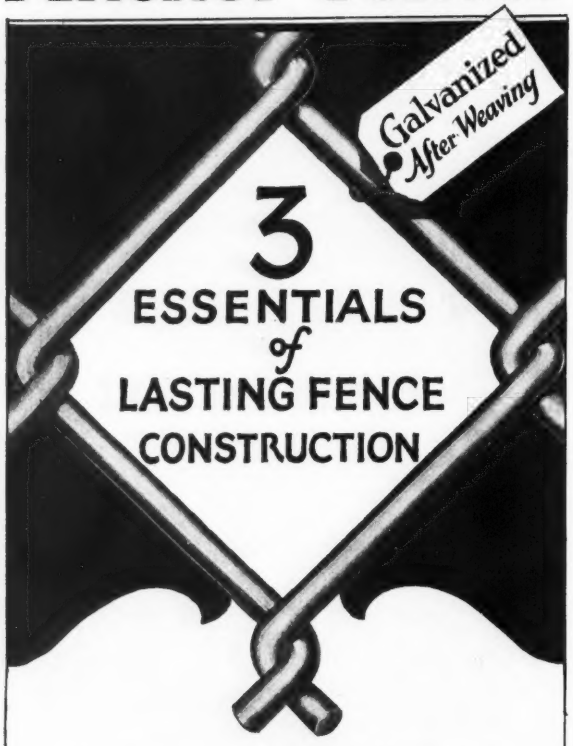
WRITE FOR SPECIFICATIONS

Ohio Valley Rock Asphalt Company

Incorporated

916 Schmidt Bldg. **Cincinnati, Ohio**

Anchor Fences



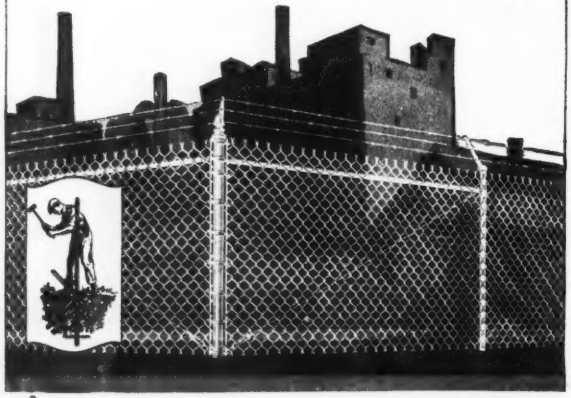
(1) *Drive-Anchorage:* Anchor fence posts are secured in the ground by drive-anchors as illustrated by our trade-mark below. They permanently hold the fence in alignment.

(2) *Rust-resisting Fabric:* Anchor Chain Link Fences have a fabric of copper-bearing steel wire. This wire is rust-resisting in itself.

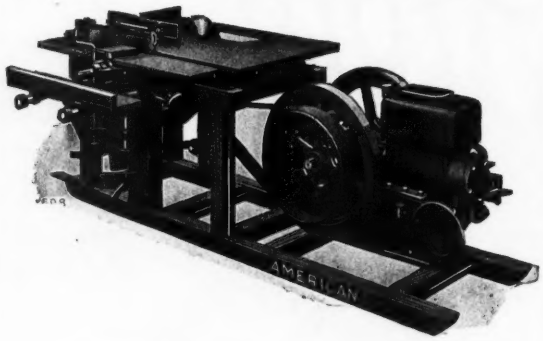
(3) *Galvanizing After Weaving:* As a double safeguard against corrosion, the wire used for our fabric is first woven and then put through a tank of molten zinc. It is armored throughout by a heavy zinc coating four to five times as heavy as that applied to ordinary commercial wire, galvanized before weaving.

Before you buy a fence, let us tell you more about these Anchor features of lasting fence construction.

ANCHOR POST IRON WORKS
50 Church Street New York, N. Y.
Branch Offices and Sales Agents in Principal Cities
2599-G



AMERICAN COST CUTTERS



Portable Woodworking Machinery for use on the job.

Saw Mills, Woodworkers, Planers, Jointers, Band Saws, Re-saws, Cut-off Saws.

Ask for Complete Catalog

American Saw Mill Machinery Co.
164 Main Street Hackettstown, N. J.

Kilby Frog & Switch Co.

Birmingham, Ala.

Manufacturers of

Railroad Crossings, Frogs and Switches

Manganese Track Work a Specialty

Balkwill Cast Manganese Articulated Crossings

Graham Flange Frogs

(The Savers of Maintenance)

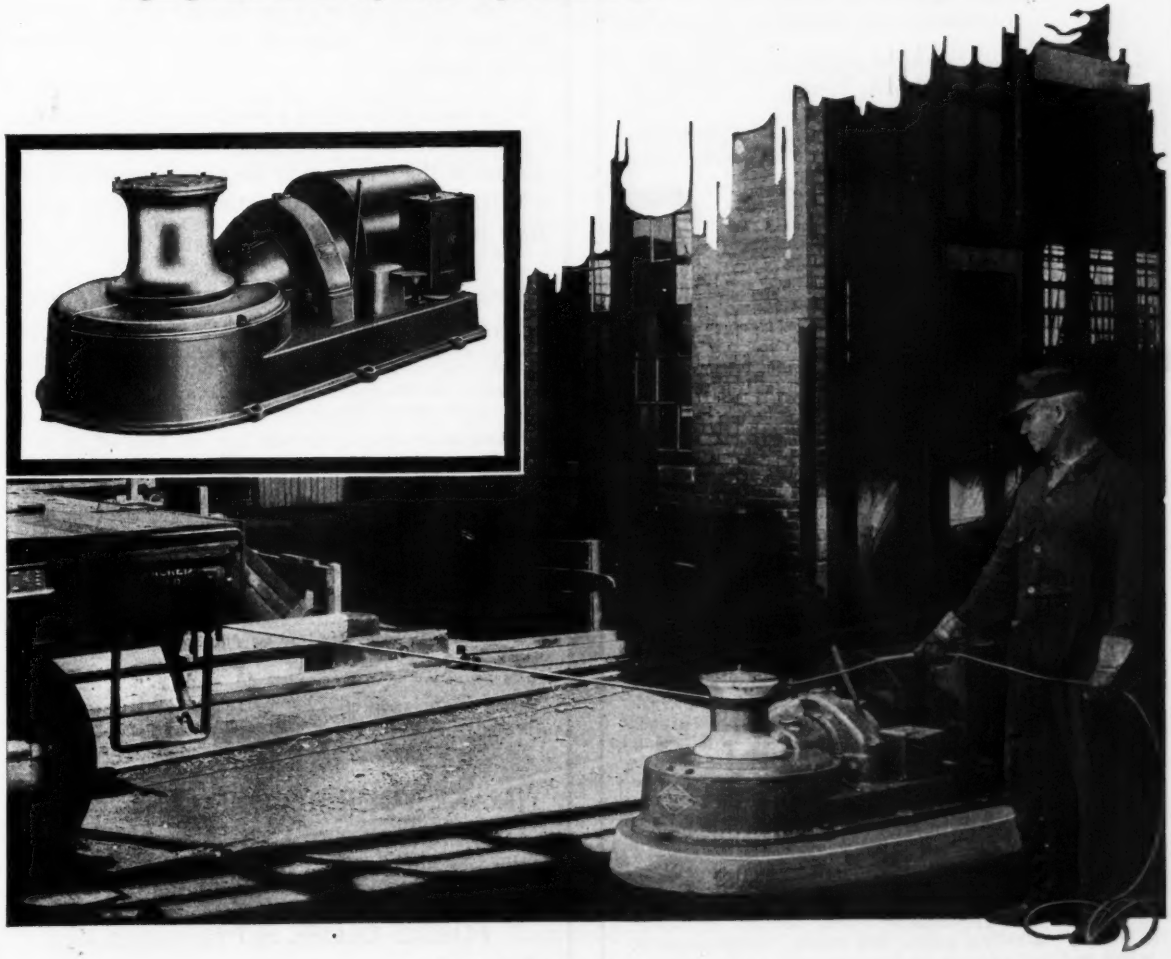
CLYDE

ELECTRIC CAPSTAN CAR PULLER

The Clyde Electric Capstan Car-puller is adapted to successful operation in any plant where a need exists for moving railroad cars to and from loading stations.

It consists of a vertical capstan driven through spur and bevel gearing by an electric motor. Gears run in a bath of oil insuring perfect lubrication. All power transmitting parts are completely enclosed. Built for direct or three phase alternating current.

Detailed information may be secured from the home office, any Clyde branch or from any authorized Clyde dealer. The car-puller carries the same rigid guarantee as any other Clyde line unit.



You'll Take Pride in Your Clyde!

CLYDE IRON WORKS SALES COMPANY

Sole Distributors for CLYDE IRON WORKS, Duluth, Minn.

Stocks Carried in the Following Warehouses:

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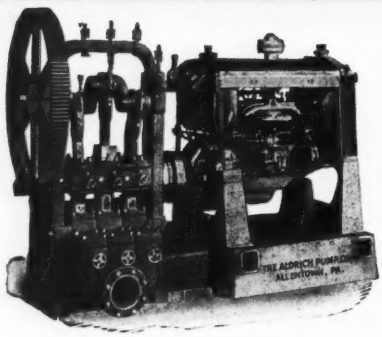
CHICAGO 11 So. La Salle St | CINCINNATI 1913 Union Central Bldg. | MEMPHIS 69 Union Ave. | JACKSONVILLE, FLA. 43-45 W. Forsyth St. | SAN FRANCISCO. 50 Fremont St.

ALDRICH



FOR ISOLATED POINTS
WHERE ELECTRIC CURRENT
IS NOT AVAILABLE

THE ALDRICH PUMP CO.
ALLENTOWN, PENNA.

VERTICAL GENERAL SERVICE TRIPLEX
HORIZONTAL HIGH PRESSURE QUINTUPLEX

PUMPS

Use

DIXON'S SILICA-GRAPHITE PAINT

for the economical protection of all exposed metal or wood work.

It is immune from attacks by acids, alkalies, gases, and fumes. Impervious to water and not affected by heat or cold.

The longevity of Dixon's Paint is due to the wear-resisting pigment,—flake silica-graphite, and the vehicle, boiled linseed oil.

Write for long service records and Booklet 187-B

Joseph Dixon Crucible Company
Jersey City, N. J. Established 1827

October Is Your Opportunity

The annual convention of the Roadmasters' and Maintenance of Way Association will be held in Kansas City, Missouri, on September 22, 23 and 24.

Railway Engineering and Maintenance

for October will be issued in advance of its regular date, to permit it to be distributed at the convention. It will contain all reports to be presented at that meeting.

This issue thus offers advertisers distinct advantages as a means of bringing their product to attention of the members at the time they are directly interested in discussing the subjects to which these products relate.

Special Advantages of the October Issue

FIRST—THE OCTOBER ISSUE will be in the hands of every attendant at the convention from opening to adjournment. The officers of the Association rely upon Railway Engineering and Maintenance for their copies of the reports and the reports are read from it on the floor of the convention.

SECOND—As its contents will form the basis of all discussions, its advertising pages will be used as a source of reference in these discussions and in outside exchange of views.

THIRD—Advertisers whose products are represented in its pages will have their special "talking points" in front of those who are discussing reports on any phase of track work.

FOURTH—Following the convention the forms will be reopened and as many pages added as may be necessary to cover the discussions and the activities of the Roadmasters' Association and the Track Supply Association—thus completing the record.

FIFTH—In addition to the advantages named above, the advertiser in the October issue will receive the benefits of the regular issue as well as of the additional circulation.

MAKE YOUR RECORD COMPLETE

by using liberal space in the October issue. The time is ripe for advertising. The roads must buy and are buying.

FORMS CLOSE SEPTEMBER 12

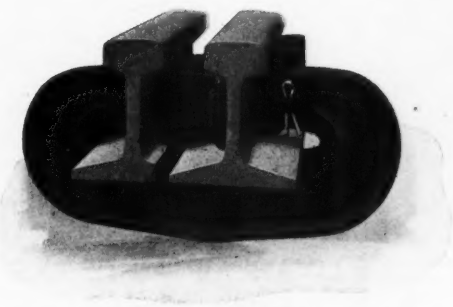
Make your reservation for space now and secure the benefits of the regular issue and the 1000 extra circulation.

RAILWAY ENGINEERING AND MAINTENANCE

608 So. Dearborn Street, Chicago, Illinois
30 Church Street, New York City

MORDEN

TRACK SPECIALTIES

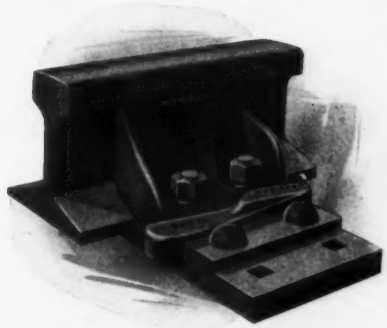


ADJUSTABLE GUARD RAIL CLAMP

A clamp for heavy service with universal drop forged yoke made of special heat treated steel.

This clamp is GUARANTEED. A clamp that is not dependable is expensive at any price.

Made for rails from 80 to 130 lbs. per yd.



ADJUSTABLE RAIL BRACE

A heavy malleable brace for general use on switches, slip switches and guard rails.

Should be in use on all interlocked switches to insure an easy and close adjustment for taking up wear between rail, brace and plate.

MORDEN FROG & CROSSING WKS.

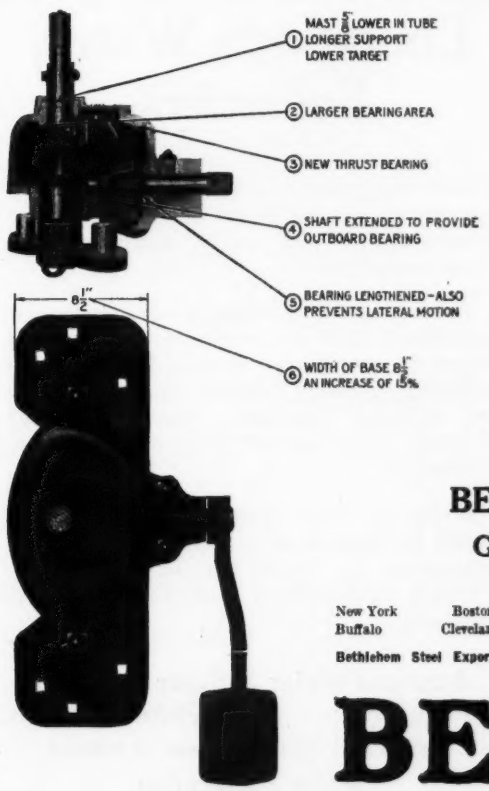
CHICAGO

Manufacturers of

FROGS, CROSSINGS, SWITCHES SWITCH STANDS, GUARD RAIL CLAMPS

All Kinds of Standard and Special Track Work for Steam and Electric Railways

COMPROMISE JOINTS, RAIL BRACES, TIE BARS, DERAILS, SLIDE PLATES, ETC.


MAST 5/8 LOWER IN TUBE
1 LONGER SUPPORT LOWER TARGET
2 LARGER BEARING AREA
3 NEW THRUST BEARING
4 SHAFT EXTENDED TO PROVIDE OUTBOARD BEARING
5 BEARING LENGTHENED - ALSO PREVENTS LATERAL MOTION
8 1/2"
6 WIDTH OF BASE 8 1/2" AN INCREASE OF 15%

Six Improvements!

Five of the new improvements on the New Century Switch Stand provide additional and larger bearings for the working parts of the stand, while the sixth improvement provides a broader base, greatly increasing the stability of the stand and lengthening the life of the switch ties. Particular attention is called to improvement No. 4, which provides an outboard bearing.

The larger bearings reduce wear to the minimum, and eliminate lateral and vertical motion in the working parts of the stand.

It is typical of Bethlehem's policy, maintained throughout the past thirty years, that these improvements have been made without in any way affecting the interchangeability of New Century Switch Stand parts.

Catalog on request.

BETHLEHEM STEEL COMPANY

General Offices: BETHLEHEM, PA.

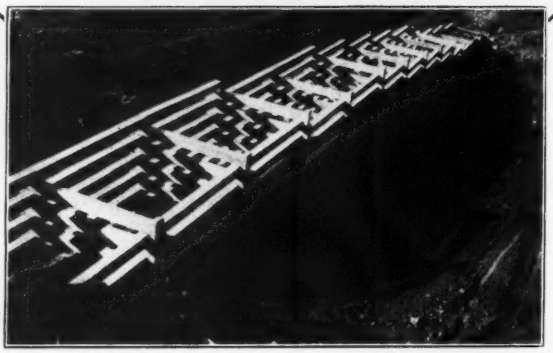
District Offices:

New York, Buffalo, Boston, Cleveland, Philadelphia, Cincinnati, Baltimore, Detroit, Washington, Chicago, Atlanta, St. Louis, Pittsburgh, San Francisco

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of Our Commercial Products

BETHLEHEM

KONKRETE KRIBBING



THIS view of a Massey Type "H" Crib Wall before the filling was placed shows clearly its simple construction. Only two types of units are required—the rectangular beams called "stretchers," which are laid longitudinally, and the members with "T"-shaped heads called "headers," which are laid transversely.

The simplicity of installation is one of the reasons why Massey Cribbing is being so widely adopted. Our Catalog Supplement contains the latest developments in crib wall design and construction. A copy is yours for the asking.

MASSEY CONCRETE PRODUCTS CORP.

CANADIAN CONCRETE PROD. CO. (Ltd.)

Peoples Gas Bldg. Chicago *Transportation Bldg. Montreal*

Sales Offices

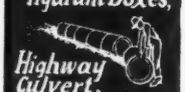
New York 50 Church St.
Atlanta Candler Building
Cincinnati 528 Dixie Terminal Building
St. Louis Railway Exchange
San Francisco 1101 Matson Building
Los Angeles 390 Pacific Electric Building

Plants Located at

Clearing (Chicago), Ill.
Colton, Calif.
Dallas, Texas
Kansas City, Kan.
Melbourne, Ky. (Cincinnati)
Memphis, Tenn.
Minneapolis, Minn.
Montgomery, Ala.
Newark, N. J.
Belleville, Ont.
Chatham, Ont.
Salt Lake City, Utah
Spokane, Wash.

Other Products

Culvert Pipe, Battery Wells, Cable Posts, Hydrant Boxes,



Highway Culvert, Junction Boxes, Manholes, Marker Posts, Meter Boxes, Mile Posts,

Cattle Pass, Oil Houses, Poles, Relay Posts, Sewer Pipe,

Telephone Booth, Switchmens-Houses, Signal Foundations, Transformer Stations,

Piling.

SULLIVAN AIR LIFTS ARE ECONOMICAL

This picture is of the interior of the "Mesa" Pumping Station, Southern Pacific Railway, El Paso, Texas, showing the two 1200-foot Angle Compound Compressors, belt-driven by Oil Engines

This plant operates SULLIVAN AIR LIFT pumps in two 12-inch wells, which deliver 83,360 gallons per hour, compared with 100,000 gallons *per day*, formerly supplied by deep well pumps in 6 8-inch wells.

The fuel oil cost per 1,000 gallons pumped is now $0.014.

The "Mesa" station is one of many railroad water plants in which Sullivan air lift and Sullivan air compressors are saving money for their owners.

Ask for special Railroad booklet, No. 19129.

SULLIVAN TRADE MARK
MACHINERY COMPANY
411 Peoples Gas Bldg. Chicago

Lime-Soda Water Softeners

We make LIME-SODA WATER SOFTENERS of both the ground operated and top operated types to purify water for prevention of scale deposits and corrosion in locomotive boilers.

The saving that is being effected by purifying water is most ably portrayed in the recent report of the Water Service Committee at this year's Chicago Convention of the American Railway Engineers' Association. We recommend this report for your careful consideration.

Write for our literature which gives, in detail, the results of our twenty-three years' experience in furnishing WATER SOFTENER PLANTS to twenty-six American Railroads.

American Water Softener Company
Fairhill P. O. Philadelphia, Pa.

Specialists for twenty-three years in Railroad

Water Purification

BERG
CONCRETE SURFACER AND FINISHER

For Elimination of Fins, Board or Form Marks, and All Surface Irregularities.

Surfaces and finishes all kinds of concrete construction—such as buildings, bridges, walls, culverts, dams, foundations, monuments, etc. For interior and exterior work.

Portable, light weight, simple construction, easily handled. Operated on alternating or direct current. Supplied for either 110-125 or 220-250 voltage.

Write for full details and list of prominent users.

The Concrete Surfacing Machinery Co.
Department G
4669 Spring Grove Avenue,
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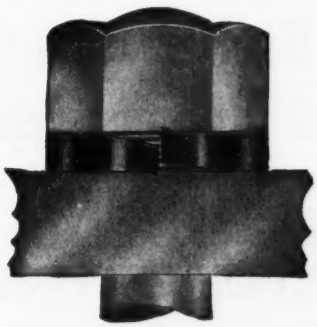

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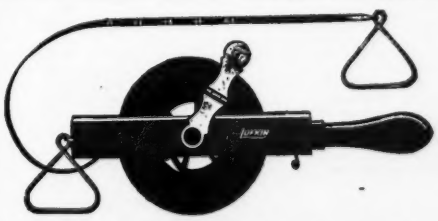

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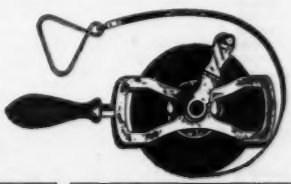

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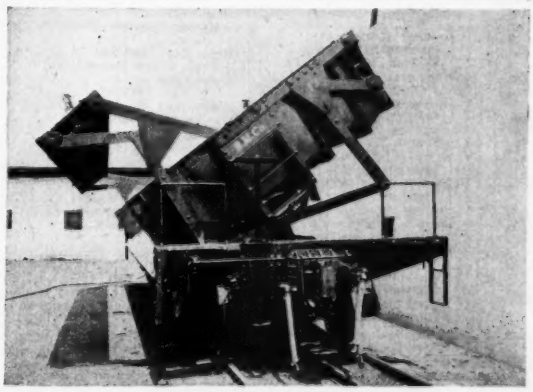

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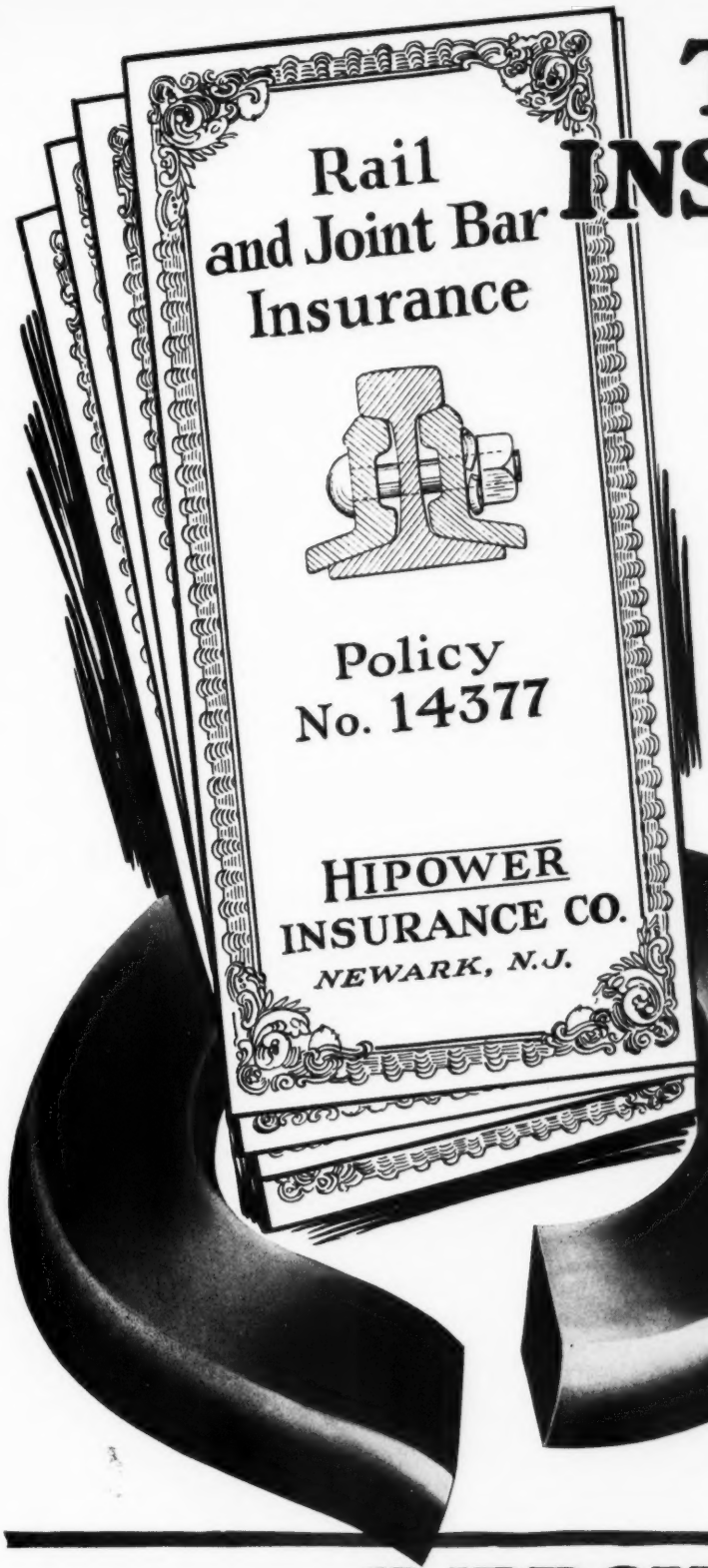

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IMPROVED HIPOWER

THE NATIONAL LOCK WASHER CO.
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Tight Bolts increase the strength of joints and IMPROVED HIPOWER keeps track bolts tight.

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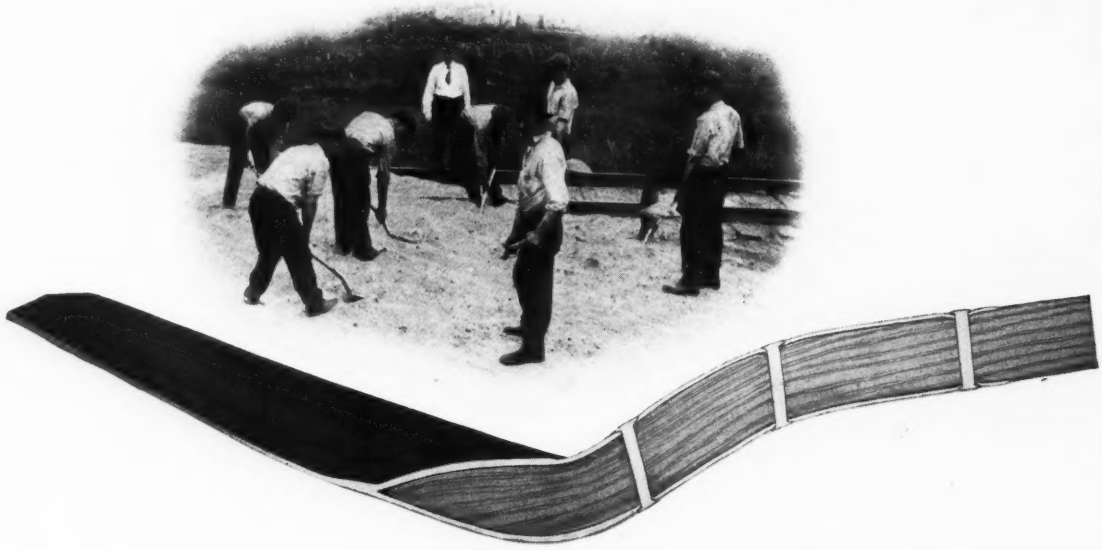

STRONG!

where 85% of all shovels fail

Between the point of the socket and the upper end of the straps occur 85% of all shovel failures.

Saw a Verona shovel longitudinally down the middle. Note its construction. See how the double X grade Northern white ash handle fits into the socket. Observe that it extends to the very point of the socket, excluding moisture, preventing play, utilizing the full strength of shovel back and handle.

Then note that the straps are joined to the shovel back with a deep wide weld. Study the perfection of that weld. Note that there are no rivets here to work loose, drop out, or start rust spots.

This is not the only advantage the Verona shovel boasts. But its strength at this point of usual failure promises long life under hard conditions of service.

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San Francisco New Orleans Washington St. Paul Denver